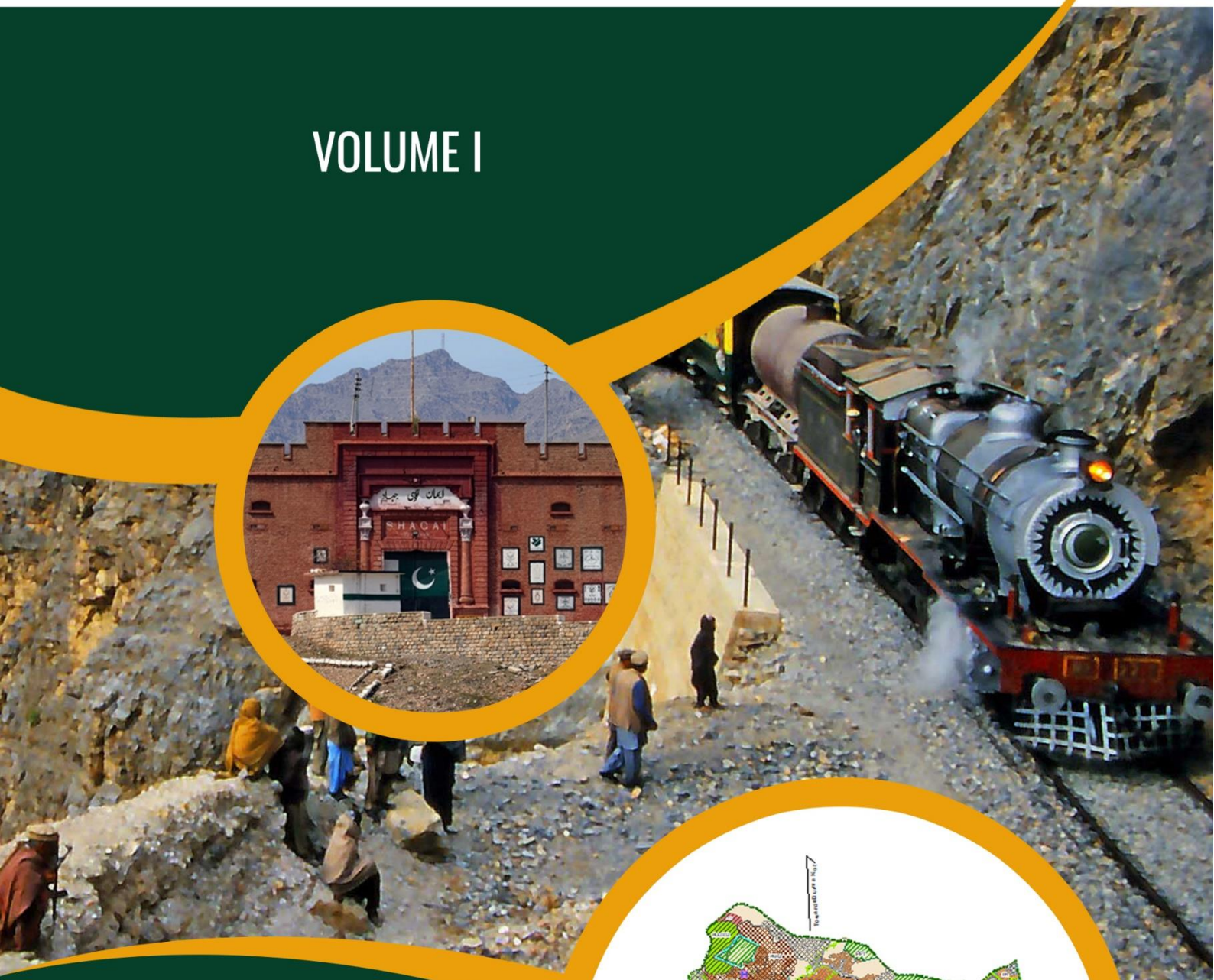
MASTER PLAN OF LANDI KOTAL URBAN CENTER, DISTRICT KHYBER, 2024-42

VOLUME I



MASTER PLAN PROJECT (MPP)
URBAN POLICY AND
PLANNING UNIT
DEC, 2024

URBAN POLICY UNIT
Planning and Development Department
GOVERNMENT OF KHYBERPAKHTUNKHWA

LUBCA

The Urban Unit
Urban Sector Planning & Management Services Unit (Pvt.) Ltd.

HP Consultant Planners (SMC-Private) Limited

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Disclaimer

Urban Sector Planning and Management Sector Unit (Pvt.) Ltd. has prepared the Master Plan of Landi Kotal. Maximum care and caution were observed while developing this document.

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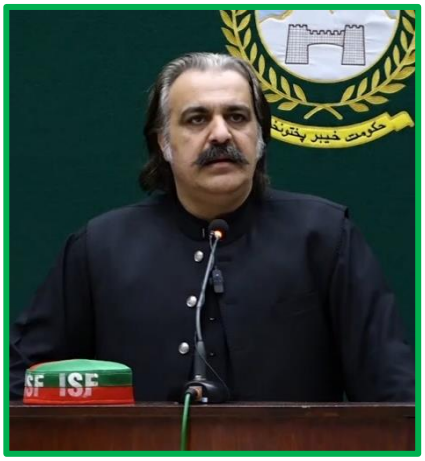
MESSAGE FROM THE CHIEF MINISTER KHYBER PAKHTUNKHWA



Khyber Pakhtunkhwa, the third most populated province of Pakistan, is experiencing rapid urbanization due to various push and pull factors. Lack of proper planning has resulted in overcrowding of all major urban centers coupled with traffic congestion, environmental pollution and ribbon development along main roads. Insufficient investment in urban infrastructure, lack of trained human resource and poor management of key infrastructure are the causes of weak coverage and low service quality. A significant proportion of the urban population continues to live in dilapidated environment and urban slums. The current provincial government has introduced a policy shift from “containing urbanization” to “managing urbanization”, adopting an integrated approach that capitalizes on the potential of cities and that can convert this constraint into an opportunity and transform the cities to be engines of economic growth.

The provincial government is aware of these challenges for which it has prioritized an innovative planning approach that would bridge the gap between urban and rural development. Through coordinated efforts, district land use plans for districts and master plans for urban centers across the province have been developed. These master plans are designed to address core urban issues such as traffic congestion, provision of affordable housing, traffic & transportation problems, unemployment, lack of education and healthcare facilities and environmental degradation. These plans provide clear and actionable road maps for decision-makers to guide them towards sustainable development ensuring that both urban and rural areas can meet the needs of growing populations while safeguarding natural resources for future generations.

These achievements wouldn’t have been possible without the dedicated and untiring efforts of the Master Plan Project, Urban Policy and Planning Unit (UPU) of the Planning and Development Department, Government of Khyber Pakhtunkhwa. I would like to extend my gratitude to all stakeholders, community members and local government officials whose contributions have been instrumental in shaping these comprehensive plans.

Looking ahead, these master plans stand as a testament to our government’s unwavering commitment to fostering sustainable, inclusive and resilient urban development. Together, we will ensure that Khyber Pakhtunkhwa’s cities and towns continue to thrive as hubs of economic activity, cultural heritage and community well-being, securing a prosperous future for all generations to come.

Mr. Ali Amin Gandapur
Chief Minister
Government of Khyber Pakhtunkhwa

MESSAGE FROM THE MINISTER OF LOCAL GOVERNMENT, ELECTIONS, AND RURAL DEVELOPMENT DEPARTMENT

The Government of Khyber Pakhtunkhwa is committed to fostering a well-planned, resilient, and sustainable urban future for our cities. Recognizing the rapid pace of urbanization and its associated challenges, we have taken a proactive approach to urban planning and development that aligns with national priorities and international commitments, including the Sustainable Development Goals (SDGs).

Through the Master Plans for Cities, we are laying the foundation for balanced regional development, economic growth, and environmental sustainability. These plans will guide future investments in infrastructure, housing, transportation, and public services to ensure that our cities remain inclusive, competitive, and climate-resilient. Our focus is to bridge the urban-rural divide by ensuring equitable resource allocation and extending modern infrastructure.

The Master Plans represent a vision for progress, prosperity, and sustainability. With strong political will, coordinated action, and community participation, we are determined to transform our cities into hubs of opportunity, innovation, and well-being for all.

The Urban Policy and Planning Unit (UPU) of the Planning and Development department played a pivotal role in preparing these master plans. These master plans truly reflect the collaborative efforts of a wide range of stakeholders including provincial line departments, district administration, NGOs, local political leadership, and the public at large. I extend my sincere gratitude to UPU and all those who have contributed their expertise and efforts toward creating plans that will not only tackle present challenges but also lay the foundation for a sustainable urban future.

Mr. Arshad Ayub Khan
Minister LGE & RD Department
Government of Khyber Pakhtunkhwa

MESSAGE FROM THE ADDITIONAL CHIEF SECRETARY PLANNING AND DEVELOPMENT DEPARTMENT, GOVERNMENT OF KHYBER PAKHTUNKHWA

The rapid urbanization across Khyber Pakhtunkhwa has created both opportunities and challenges. On the one hand, urbanization is transforming the socio-economic landscape of the province while on the other, it has caused economic issues such as unplanned expansion, inadequate infrastructure, traffic congestion and increased pressure on public resources. To enhance the economic vitality of urbanization and reduce its negative impacts, there is an urgent need of structured and sustainable urban planning to fully realize the potential of our urban centers.

The formulation of master plans for the towns and cities is a crucial step toward achieving this goal. These plans will provide comprehensive frameworks to guide towards the planning of towns and cities, optimize land use, improving economic productivity and ensuring the equitable distribution of resources. Sustainability remains a key priority in the plans emphasizing environmental protection while aligning resources to meet the growing needs of the urban population. The master plans will serve as structured guidelines for local authorities, district administrations and municipalities to systematically undertake and implement future development initiatives. These plans support the achievements of core urban needs such as housing for all, transportation and public facilities ensuring that cities evolve into resilient, liveable and economically viable centers that can meet the aspirations of residents.

The Urban Policy and Planning Unit (UPU) of the Planning and Development department played a pivotal role in preparing these master plans. The plans truly reflect the collaborative efforts of a wide range of stakeholders including line departments, district administration, NGOs, local political leadership and the community. I extend my sincere gratitude to UPU and all those who have contributed their expertise towards developing master plans that will not only tackle present challenges but would also lay the foundation for a sustainable urban growth.

As we move forward with implementation, I am pleased to announce that the projects identified in these master plans shall be included in the upcoming Annual Development Programmes (ADPs) to ensure their timely execution and alignment with provincial priorities. I am confident that these master plans will serve as benchmarks for urban development. They are testament to the government's commitment to foster well-planned and thriving urban centers that support the prosperity and well-being of citizens for all the times.

Mr. Ikram Ullah Khan
Additional Chief Secretary
Planning and Development Department
Government of Khyber Pakhtunkhwa

MESSAGE FROM THE SECRETARY LOCAL GOVERNMENT DEPARTMENT GOVERNMENT OF KHYBER PAKHTUNKHWA

The Landi Kotal Master Plan of 2024-2042 represents a significant milestone in our efforts to foster sustainable urban development and shape the future of the city. As Landi Kotal continues to grow, there is an increasing need for structured, sustainable and visionary planning to accommodate rising population, promote economic growth and ensure equitable access of all citizens to essential services and resources.

At the Local Government Election & Rural Development (LGE&RD) Department, we are committed to undertake initiatives that contribute to the overall prosperity of Khyber Pakhtunkhwa. The aim is to ensure that each part of the province shall benefit from development strategies. This master plan is a reflection of that vision — offering a comprehensive framework that addresses immediate urban challenges while laying the foundation for a long-term resilient growth.

The Landi Kotal Master Plan of 2024-2042 has been designed to maintain an equilibrium between urban expansion and the preservation of valuable cultural heritage and environmental resources including prime agricultural land in the peri urban limits. The plan will create investment and employment opportunities and will generate revenue for further development and enhance the overall quality of life for the people of Landi Kotal. Moreover, it underscores the importance of collaboration among public institutions, stakeholders and residents in shaping an inclusive, sustainable and prosperous urban centers.

I would like to commend the Urban Policy & Planning Unit (UPPU) of the Planning and Development Department and all stakeholders for their dedication and hard work in developing this master plan. The successful implementation of the plan will not only transform Landi Kotal but would also serve as a model for other cities throughout the province.

We resolve our commitment to fostering inclusive growth, ensuring that development opportunities are accessible to all and contributing to a brighter and more prosperous future for the people of Khyber Pakhtunkhwa.

Dr. Amber Ali Khan
Secretary LGE & RD Department
Government of Khyber Pakhtunkhwa

Acknowledgements

First of all, I am extremely grateful to almighty Allah who enable me and my team to successfully complete gigantic work of the preparation of Master Plan of Landi Kotal. The preparation of Landi Kotal Master Plan 2024-2042 has been a collaborative and dedicated effort aimed at ensuring the sustainable development of Landi Kotal, the vibrant urban center of District Khyber, Khyber Pakhtunkhwa. This report reflects the collective commitment of all stakeholders toward the rational, balanced, and systematic use of resources to address the city's challenges and guide its future growth and development. This master plan forms an integral part of Khyber Pakhtunkhwa's broader initiative to promote sustainable urban development across the province. It addresses critical aspects of urban management, including housing, transportation, socio-economic development, and environmental sustainability, providing a comprehensive framework for sustainable growth of Landi Kotal.

I extend my sincere gratitude to the Urban Policy & Planning Unit, P & D Department, Government of KP for entrusting my team with this significant initiative. Special thanks to my existing and former Executive Directors, UPU including Mr. Zubair Asghar Qurashi, Mr. Adeel Shah (current Secretary, P and DD), Mr. Inayatullah Waseem, Mr. Shah Mehmud, Mr. Abdul Basit, Mr. Ifthikhar, and Mr. Fazal Khaliq (current ED, UPU) for their insightful leadership and support throughout the planning process. I am also thankful to all my colleagues in UPU and MPP especially Dr. Muhammad whose expertise and efforts during the conceptualization, data collection, analysis, and review phases were instrumental in shaping this detailed master plan. I am deeply thankful to the officials of the District Administration, including Commissioner and Deputy Commissioner Landi Kotal District Khyber, and other key officials for their cooperation, guidance, and active involvement during the course plan making. Their local insights, support, and valuable feedback have greatly enriched the plan, ensuring its relevance to the unique context of Landi Kotal.

Special recognition is due to Urban Unit Punjab for their dedicated efforts in preparing this report. The team's technical expertise, unwavering commitment, and hard work were instrumental in successful completion of this master plan. Finally, I express my appreciation to everyone who contributed to this plan in various capacities. This plan represents a shared vision for a sustainable, prosperous, and resilient future Landi Kotal.

As this master plan is the first of its kind and will not be free from errors, however, I am fully optimistic about the successful implementation of this plan. In due course of time the plan be reviewed and necessary changes will be made in future revisions. Together, let us work toward building a thriving and sustainable Landi Kotal for generations to come.

Adnan Salim,
Project Director, Master Plan Project
Urban Policy Unit, P & DD

Executive Summary

Located in the north-west, Khyber Pakhtunkhwa (KP) is the third-largest province of Pakistan by population. It has an average annual growth rate of 2.89% that is relatively higher than the national average of 2.40% estimated by the Pakistan Bureau of Statistics in 2017 whilst the urban population stood at 5.7 million, with the Newly Merged Districts (NMDs) accounting for 13% of the provincial population—contributing around 4.6 million people. This extensive urban growth has been driven by the province's complex socio-political dynamics, including the influx of Afghan refugees and persistent law-and-order challenges in districts bordering Afghanistan. Subsequently, the urban centres in KP are growing rapidly in haphazard and unplanned manner, mainly promoting ribbon development owing to lack of comprehensive planning initiatives by the Provincial and Local Governments.

Considering the challenging scenario, the Prime Minister of Pakistan directed the provincial and local governments to prepare Master Plans of cities and towns that would inform and direct the urban growth, encourage high-density development while protecting the prime agricultural and environmentally significant land. The Urban Policy & Planning Unit (UPPU) of the Planning and Development Department, Government of KP commissioned the preparation of Master Plans of Provincial, Divisional and District Headquarters of KP province. This initiative includes the preparation of Landi Kotal Urban Center Master Plan 2042 that would inform and direct the future growth of Landi Kotal in a sustainable way to efficiently enhance its productivity and functioning whilst improving the quality of life of its residents. The Urban Unit and HP Consultants were in a joint venture hired as the Project Consultant by UPPU to carry out the extensive exercise of the preparation of the Landi Kotal Urban Center Master Plan 2042. The primary objective of the plan is to develop sustainable, compact, and environmentally sound proposals to guide Landi Kotal's future development. The plan serves as a strategic roadmap for the city's growth up to the year 2042, aiming to enhance productivity, improve quality of life, and ensure spatial equity for its residents.

Landi Kotal is anticipated to undergo substantial population growth over the next two decades. Population projections suggest an increase from 33,697 in 2017 to approximately 55,513 by 2040. This growth is influenced by multiple factors, including

socio-cultural dynamics, cross-border migration, and the ongoing security situation in Afghanistan-adjacent districts. However, due to longstanding institutional neglect, the former FATA region, including Landi Kotal, has faced limited economic opportunities and minimal formal planning. Consequently, the city is now grappling with unregulated urban expansion, fragmented development, substandard road networks, and poor enforcement of building regulations, posing significant challenges to integrated infrastructure development and service delivery.

To respond to these challenges, this Master Plan for Landi Kotal has been formulated that outlines a sustainable urban development strategy for Landi Kotal. It seeks to accommodate population growth while promoting a resilient, inclusive, and functionally efficient urban environment. A collaborative and inclusive approach was taken to develop a vision for the Landi Kotal Urban Center, engaging with the local community and diverse stakeholders including government officials, city administrators, NGOs, local elders, and community members. Through this extensive engagement, a shared vision statement for the Landi Kotal Master Plan was crafted, reflecting the aspirations and needs of the community.

"*A trade city with a proper border management system that enhances peace and economic prosperity with better transportation, clean drinking water along with other municipal services and having effective public administration while conserving the heritage and cultural norms of the area.*"

Building on this shared vision, the plan establishes a clear set of goals and objectives for Master Plan of Landi Kotal 2042. To address the complex challenges faced by Landi Kotal, the master plan has adopted a multifaceted and forward-looking approach to development. Central to this strategy is the adoption of scenario-based planning, aimed at assessing the city's strengths, weaknesses, opportunities, and constraints. Three future growth scenarios were formulated, Business as Usual, Sectoral Planning, and Multi-Nuclei Development. Following a thorough evaluation of their respective implications, the Multi-Nuclei Development scenario was selected as the preferred strategy. This approach promotes decentralized and diversified growth by establishing multiple nuclei centers, providing the flexibility to accommodate a range of economic activities and land uses. It offers a balanced framework for spatial expansion and

resource allocation, minimizing urban sprawl while enhancing connectivity and service delivery.

The project area encompasses five neighborhood councils covering a total area of 10.43 sq. km., the urban center currently accommodates 33,697 residents across 4.76 sq. km. of built-up space, with an average household size of 7.32. Recognizing the need for future expansion, the total extent of the proposed additional land use area including livestock and diary development zone is 0.18 sq. km. for a population of 55,513 by 2042.

This Master Plan for Landi Kotal Urban Center aims to transform the city into a sustainable urban hub by focusing on compact development, improving public services, stimulating economic growth, and promoting tourism. This comprehensive plan envisions Landi Kotal as a regional hub for social and economic services, catering to the needs of local and regional communities, and setting a benchmark for sustainable development.

The Plan seeks to provide and ensure adequate housing availability spatially as well as in terms of affordability. By 2042, the demand for housing is projected to surge to 21,898 units. To address this, a residential area of 1.31 sq km., has been proposed with housing distribution catering to diverse income groups. The plan allocates 73.7% of residential areas for low-income groups, 21.1% for middle-income, and 6.2% for high-income groups. Moreover, infill residential zones have been proposed on 1.31 sq km area to revitalize urban areas, increase efficiency, attract new investment and residents within Landi Kotal urban center.

Enhancing the urban environment, the plan proposes a significant increase in recreational spaces by proposing parks covering 0.12 sq.km by 2042. These spaces are strategically located throughout the urban center, aimed at promoting environmental sustainability, community interaction, and improving the overall livability of Landi Kotal. This development intends to create vibrant community hubs that foster social cohesion, recreation, and ecological balance.

To support economic growth and commercial vibrancy, the Master Plan strategically expands the commercial areas within Landi Kotal, building upon the existing commercial footprint of 0.23 sq.km with highest density being observed in Landi Kotal

NC 4 and 5 over the last decade. These markets serve as vital commercial centers, offering retail and wholesale goods. In order to enhance convenience and reduce travel time, proposed commercial areas will be situated near neighborhood units, following the self-sufficient neighborhood planning concept. This will decrease travel time, fuel consumption, and costs. Moreover, a Declared Central Business District (DCBD) along National Highway-5 is designated to centralize high-value economic activities, enhance regional commerce, and stimulate local investment. These developments will not only improve commercial opportunities but also streamline urban mobility and economic dynamism in the region.

Addressing industrial growth, the Landi Kotal Master Plan introduces two substantial industrial zones in areas previously devoid of industrial infrastructure. These zones, accounting for 0.30 sq. km., strategically placed near the mining areas and along Torkham Highway. Additionally, specialized timber and warehousing zones have been proposed each comprising of 0.01 sq km. The strategic positioning near critical transport infrastructure aims to catalyze industrial clustering, maximize efficient resource utilization, and spur regional employment and economic prosperity. This approach parallels successful industrial strategies elsewhere in the region, fostering a robust economic foundation for sustainable growth.

To bolster educational infrastructure, the Master Plan prioritizes accessibility and capacity enhancement. Complementing the existing network of 148 primary schools in Landi Kotal Tehsil (85 for boys and 63 for girls), 16 middle school (11 boys and 6 girls), and 8 high schools (5 for boys and 3 for girls), the plan recommends new primary, middle, and high school facilities strategically distributed throughout Landi Kotal's urban center. These additions ensure that educational resources are within manageable distances for children, substantially improving accessibility, attendance rates, and educational outcomes. Such expansion aligns closely with established best practices aimed at achieving educational equity and optimizing land-use efficiency.

The existing health infrastructure in Landi Kotal, comprising Health Units, Community Health Centers, District Headquarter Hospital, small hospitals, and private clinics, is insufficient to meet the needs of the growing population. Recognizing current healthcare service shortfalls, the Master Plan significantly augments Landi Kotal's healthcare infrastructure by proposing area around 0.07 sq.km. Comprehensive

proposals include the establishment of new healthcare facilities across the urban center, supported by the recruitment of specialized medical staff, technical personnel, and well-equipped laboratories. The goal is to develop an autonomous and resilient healthcare system capable of addressing existing and future needs, thus enhancing community health resilience and well-being comprehensively.

In alignment with sustainable agriculture and food security goals, the plan designates 1.5 sq.km for reserved agriculture areas, green spaces and plantation. These areas will utilize sustainable agriculture practices such as organic farming, conservation agriculture, and climate-resilient cropping systems, while allowing for ground water recharge and improving the air quality of the urban centre. Adjacent to this, a Livestock and Dairy Development Zone covering 0.13 sq.km has been proposed on Northwest side of Landi Kotal, near to Landi Kotal road. Additionally, slaughter house having an area of 0.02 sq.km has been proposed near the Shalman Road. These proposal aims to strengthen local agricultural economies through enhanced dairy production and livestock management practices. This integrated agricultural development approach ensures food security, promotes economic diversification, and supports environmental sustainability.

Transportation and connectivity within Landi Kotal will undergo transformative improvements through detailed infrastructural enhancements proposed for implementation by 2042. The Master Plan includes rehabilitation and Widening of Shalman Road, Parokhel Road and Tehsil Road, dualization of National Highway N-5 / Torkham Road, including the bypass circling Landi, the Portion of N-5 between Chargwazy Chowk and Landi Kotal Bazar and of Torkham Road Extending from the Western End of Landi Kotal Bazar. Additionally, the plan includes implementing a vehicle route permit program, designating transportation terminals as Class C terminals, and providing requisite facilities. The plan also includes paving off-street parking lots, establishing a traffic management system, initiating bus services for intracity travel, and providing infrastructure for non-motorized transport, ultimately enhancing the overall transport and connectivity in the area.

The provision of civic amenities also receives targeted attention, with a dedicated Civic Amenities Zone spanning 0.02 sq.km along National Highway-5. Strategically placed to ensure optimal accessibility, this zone will accommodate essential public services

and governmental facilities, thus enhancing the efficiency and effectiveness of municipal service delivery. Its strategic location ensures seamless public access, thus reinforcing urban functionality and community convenience.

Furthermore, recognizing the importance of slum rehabilitation, the Master Plan outlines comprehensive slum improvement initiatives designed to substantially uplift living standards in informal settlements. These improvements include paved streets, upgraded water supply and sewerage networks, improved street alignment, and the addition of critical public facilities and open recreational spaces. This targeted approach mirrors effective urban renewal programs, significantly boosting quality of life and integrating marginalized areas more fully into the urban fabric of Landi Kotal.

Collectively, these comprehensive proposals reflect a coherent vision aimed at transforming Landi Kotal into a sustainable, economically vibrant, and inclusive urban center. The plan leverages strategic spatial planning, infrastructure investments, and targeted community enhancements to deliver lasting socio-economic benefits, resilience, and sustainable urban development for its residents.

Table of Contents

List of Table

List of Figures

List of Maps

Abbreviations

ADP	Annual Development Plans
BAU	Business as Usual
BHU	Basic Health Unit
CBD	Central Business District
CCTV	Closed-circuit Television
CHC	Community Health Center
CPTED	Crime Prevention Through Environmental Design
DRR	Disaster Risk Reduction
GDP	Gross Domestic Product
GIS	Geographic Information System
GoKP	Government of Khyber Pakhtunkhwa
HIS	Household Interview Survey
KP	Khyber Pakhtunkhwa
KPEC	Khyber Pass Economic Corridor
LU&BCA	Land Use and Building Control Authority
MCHC	Mother and Child Health Center
MCA	Multi-Criteria Analysis
NC	Neighborhood Council
NGOs	Non-governmental Organizations
NMDs	Newly Merged Districts
NRM	National Reference Manual
OD	Origin Destination
PDWP	Provincial Working Development Party
QOL	Quality of Life
SDGs	Sustainable Development Goals
SMEDA	Small Medium Enterprise Development Authority
TMA	Tehsil Municipal Administration
UPPU	Urban Policy & Planning Unit
UTM	Universal Transverse Mercator
VPD	Vehicles Per Day

Definitions

- **Eco Sustainable:** It refers to actions and practices that maintain or enhance environmental well-being while ensuring the ability of future generations to do the same.
- **Ribbon Development:** Linear urban development along transportation routes.
- **Leapfrog:** Urban development that skips over intermediate areas to expand outward.
- **Vacant Land:** Land that has no buildings on it and is not being used
- **Infill Land:** Infill sites are tracts of empty or under-utilized land in urban and built-up areas. These sites are ripe with opportunity because of their location.
- **Range Land:** Rangeland is any extensive area of land that is occupied by native herbaceous or shrubby vegetation which is grazed by domestic or wild herbivores.
- **New Town:** New Towns are cities or towns that are designed from scratch and built in a short period of time.
- **Revitalization:** Renewal and improvement of a place or community
- **Compact Development:** Dense urban development with minimal space between buildings.
- **Commercialization:** The process of introducing and promoting a product or service for profit.
- **Permitted Use:** The Land Use, which is allowed in each land use class.
- **Allied Permissible Use:** The land use, though not permitted, may be allowed by the authority subject to the payment of the fee.
- **Prohibited Use:** The land use, which is neither permitted nor permissible.
- **Sustainable:** Sustainability is the practice of meeting present needs without compromising the ability of future generations to meet their own.
- **Sporadic Growth:** Sporadic growth refers to irregular or unpredictable patterns of expansion or development.

Project Introduction

Project Scope

The Province of Khyber Pakhtunkhwa (KP) is located in the northwest region of Pakistan with an area of 101,741 km². It is the third most populous province, with a population of 35 million with 52% males and 48% females, comprising of 11.9% of Pakistan's total population. In 1998, its population was 17.7 million, showing an annual growth rate of 2.89%, which exceeds the national average of 2.40%. Factors such as a high fertility rate and both temporary and permanent internal migration have contributed to this population growth.

KP has the third-largest provincial economy in Pakistan, contributing 10% to the country's overall GDP and 20% to its mining output. The major sectors contributing to the national and provincial economy are hydel electricity, mining, forestry and agriculture by generating sufficient revenue.

The urban centers in KP have been neglected in the past. This has resulted in unregulated urban growth, with less than optimal infrastructure, inefficient institutions and poor quality and outreach of civic services, which has led to low quality of life.

In Khyber Pakhtunkhwa, the process of urban development is being carried out with no proper planning mechanism and is confronted with various basic hurdles. The urban areas of the province are lacking integrated urban planning that has resulted in tremendous strain on urban land, civic infrastructure and services. Lack of proper planning has been raising several issues in every urban center including divisional headquarters; such as urban sprawl, lack of institutional reforms, unregulated and unplanned growth, traffic congestion, air pollution, poor investment and weak management of key infrastructure.

Encroachment is one of the many serious issues in almost all cities and towns causing severe congestion on roads, bazaars and streets. Vendors and shopkeepers place products in front of their shops on footpaths and pavements. These encroachments on major sites of the cities need to be removed through effective enforcement. On the other hand, the trend of road-widening and constructing under/overhead passes is only a short-term plan to fix the problem. To overcome such problems there should be long term Master Plans that technically cover all aspects of urban planning in major cities under the supervision of a single government entity.

Another critical feature of our cities is the lack of proper city limits or boundaries. Our cities are continuously growing in all directions causing the emergence of slums and squatter settlements. The formation of slums is one of the biggest challenges faced by urban centres of Khyber Pakhtunkhwa. The slums are usually characterized with the lack of services, narrow streets, illiteracy, unemployment, high rates of poverty, and low socioeconomic status of its inhabitants. These slums are commonly seen as “breeding grounds” for social problems such as crime, drug addiction, alcoholism, high rates of mental illness and extremism.

For resolving issues in the urban areas, the Urban Policy Unit has taken important steps to tackle the problems of inefficient land-use planning, lack of zoning regulations, ineffective building bylaws, growth of urban sprawl, lack of institutional reforms, identification and up-gradation of slums, encroachment, lack of clear urban boundaries, unavailability of civic facilities and ineffective urban legislation & enforcement. The most significant initiative of the Urban Policy Unit is to prepare long term Master Plans for all the divisional and district headquarter cities of Khyber Pakhtunkhwa including the provincial capital Peshawar, Divisional HQs Mardan, Abbottabad, Kohat, Mingora, Bannu and DI Khan and other major cities of KP including NMDs. The Provincial Working Development Party (PDWP) has recently revised the ADP Scheme for the Master Planning with a total cost of Rs. 537.051 million. The Master Plan is vital for the integrated and sustainable urban development of the province.

The overall objective of the Master Plan is to ensure equity and social inclusion, economic productivity, quality of life, environmental sustainability and finally infrastructure provision. Collectively these objectives will create a perception of a prosperous city. Other important features of the study are building urban growth centers, high rise development areas within the cities and new expanding areas. The Master Plan is a futuristic plan containing the best model of urban planning in the world. Beside the seven divisional headquarters (Peshawar, Mardan, Mingora, Abbottabad, Kohat, Bannu and DI Khan), the Project will also prepare Master Plans for major urban centers of NMDs of KP.

For the Land Kotal Master Plan 2042, the services of The Urban Unit and HP consultant have been hired through a competitive bidding process. Landi Kotal, located in District Khyber of Khyber Pakhtunkhwa, Pakistan, holds significant strategic

and historical value due to its location along the historic Khyber Pass and its role in facilitating regional connectivity between Pakistan and Afghanistan. Positioned near the highest point of this ancient mountain pass, Landi Kotal serves as a vital link between Pakistan and Afghanistan, especially through the nearby Torkham border. Predominantly inhabited by Pashtuns, mainly from the Afridi tribe, Landi Kotal is rooted in a rich cultural heritage reflected in its tribal traditions, language, and customs. The region has historically been a critical point of defense and trade, especially during the British era when the Landi Kotal Railway Station marked the end of the legendary Khyber train safari. Given its proximity to the broader influence zone of the historic Gandhara civilization, and its location along ancient trade routes that connected South Asia to Central Asia, Landi Kotal remains one of the key areas reflecting the enduring legacy of the region's historical and geopolitical relevance.

This master plan was completed under the following TORs:

i. Mapping of the Historical Growth Trends of the City

To understand the pattern and direction of the spatial growth of Landi Kotal the consultants conducted extensive research on the historical urban growth trends and drivers of urban growth over the period of last twenty years. To identify trends and direction of spatial growth the consultant used various sources for mapping the trends over the last 20 years period including municipal records, population census, libraries and archives, Arial photographs satellite images and other published and unpublished data and records. Latest GIS techniques were used for plotting historical growth trends on GIS maps of the city-region and articulating the drivers of urbanization and urban spatial growth.

ii. Housing Trends and Needs Assessment through Projected Population Growth Estimates

The provision of housing for all is a basic objective of the Landi Kotal Master Plan, therefore, the growth pattern and projected growth needs over the next 20 years (2042) were properly analysed and mapped.

iii. Density Maps

The conservation of prime agriculture land located around the city is another important aspect of the Landi Kotal Master Plan. Therefore, to reduce urban sprawl and

horizontal development, there is a need to promote high-density mixed-use development. To achieve this objective the master plan devised policy guidelines for the establishment of high-density mixed-use development within the existing urban boundaries including the future growth areas. The consultants carried out an extensive mapping exercise to showing the existing and proposed high-density mixed-use development.

iv. Development of Land Use Base Map

For all kind of spatial planning including master plans the preparation of a comprehensive base map is a pre-requisite. Beside other mapping techniques the consultants also used open source satellite imageries (fresh and archives) to develop an up to date map of Landi Kotal including its surrounding areas in order to support suitability analysis of existing and proposed land uses for urban development and other ancillary uses. After preparation of land cover map then extensive field surveys were carried out to identify the spacific use of each parcel of land. The consultants prepared Base map with the following details:

a. Counter lines drawn at counter interval of 5 meters.
b. Boundaries (District, Tehsil, City, Neighborhood)
c. All major and minor streets, roads, railway lines and airports (including encroachments)
d. Water supply, sanitation, sewer, and telephone networks
e. Water bodies (river and other water bodies)
f. Residential areas
g. Commercial and Mixed areas
h. Industrial areas
i. Amenities (education, health, religious, police stations, libraries, and community halls etc.)
j. Parks and playgrounds
k. Brown fields (for re-development)
l. Open spaces (agriculture all types, vacant, and graveyards etc.).

v. Taxation and Revenue Generation

It is of key importance that urban planning and associated work should be sustainable over long time. To ensure that the entities (Land Use and Building Control Authority,

Development Authorities and TMAs etc) responsible for implementation of the Landi Kotal Master Plan the consultant conducted a detailed study of the current urban taxation structure and sources including property tax, land tax, capital value tax, stamp duty and proposed suggestions for improvement. Implementation of the master pkan proposals regarding municipal taxation will increase revenue of LU&BCA and TMAs many folds and will ensure sustainability of these organizations'.

vi. Governance and Institutions

Good governance and efficient institutions is a key to the successful implementation of polies and plans. To ensure that for implantation of the Landi Kotal City Master Plan required legal and institutional framework are in placed the consultants objectively analyzed and assessed the existing relevant laws/byelaws and institutional capacity of relevant organization responsible for implementation and monitoring of the Master Plan. The consultant also proposed improvements in the existing laws & byelaws and institutional structure(s) for better implementation of the Master Plan.

vii. Land Use Regulations and Plans

The consultants also studied and analysed all existing urban planning, development and environment-related national, provincial laws and regulations (byelaws) and proposed a new set of zoning regulations for each land use zone. The consultants provide extensive input in formulation of Building Regulation 2024 and Housing Schemes Regulations 2024.

viii. Environment

To reduce pollution and create healthy living environment for the residents of Landi Kotal, the consultant studied various sources of air, noise, soil and water pollution. The consultants use state of the art techniques and equipment for identification of the level of air, water and noise pollution at various points of the city. The consultant carried out the following surveys:

a. Air quality survey at various points of the city Water quality analysis (drinking water supply and water courses)
b. Soil contamination surveys
c. Soil and geological survey/data
d. Analysis of Noise level at various points of the city

e. Identification of environmentally sensitive areas

On the basis of scientific analysis of these surveys the consultant proposed various policy measures for enhancing environmental quality of the city.

ix. Demography, Livelihood and Housing

The successful implementation of the master plan proposals mainly lies on accurate assessment of the city's demographic pattern, livelihood sources and housing conditions. For the purpose of analysis, the consultants divided the city into various zones, calculated its population densities, identified major economic activities and studies housing and related facilities in each zone. Based on these assessments the consultant formulated proposals to revitalize the existing economic base and socioeconomic structure of the city. The consultant conducted the following surveys:

a) Housing surveys including house age, height, occupancy and condition surveys.
b) Accessibility surveys for emergencies and other vehicles
c) Household economic conditions/Livelihood surveys,

The consultants also identified areas with lack of municipal services (slums) and formulated proposals for its rehabilitation/up-gradation.

x. Urban Transportation, Mobility & Accessibility

One of the major issues of Landi Kotal is traffic congestion and lack of reliable public transport. To resolve the urban transport, mobility and accessibility issues of the city the consultants thoroughly studied the existing traffic and transportation system of the city. To have better understanding of the existing situation the consultant conducted various transportation surveys explored the possible constraints and available opportunities and proposed viable solutions for easing traffic and transportation issues within the city the consultant conducted the fallowing surveys:

- Developed a detailed roads and parking inventory
- Origin, Destination, and Cordon Surveys
- Traffic counts at various roads and junctions of the city and identified the bottleneck areas to determine roads and junction capacities
- Conducted Public Transport User Interview Surveys and Household Information Survey (HIS)

- To improve internal accessibility in the city the consultant carried-out a comprehensive Traffic Signage Survey The consultant also conducted a detail study on the parking issues of the city and identified suitable areas for the development of on-street and Off-street parking lots.
- Through mobility surveys the consultant devised strategies for the establishment of synergy between land-use and urban transport.

xi. Historical/Social/Culture Heritage Development

One of the key objectives of the Landi Kotal Urban Center Master Plan 2042 is to preserve and enhance the city's historical and socio-cultural landscape. Landi Kotal holds immense cultural significance and is deeply rooted in the heritage of the region. As part of the planning process, all existing historical monuments, culturally significant places, and socio-cultural landmarks were thoroughly studied and mapped. This assessment informed the development of context-sensitive guidelines aimed at conserving heritage assets while integrating them into the urban fabric. The Master Plan seeks to capitalize on these historical and cultural assets to establish vibrant social and cultural hubs across the city, enhancing its identity, strengthening community engagement, and unlocking opportunities for tourism, heritage-led regeneration, and local economic development.

xii. Urban Design, Public Realm Quality of Life

Urban Design and Public Realm is an integral part of the master plan. Through various surveys and techniques, the consultant analysed the existing building lines, identified all public spaces, studied in detail vistas, sidewalks, street lighting, monuments, and parks etc. and formulated actionable proposals for improvements. and identified potential areas for new parks, playgrounds and public open spaces. To make the city more attractive and beautify the consultants proposed various urban beatification projects.

xiii. Water Supply, Sanitation and Solid Waste Management

In Landi Kotal, PHED is responsible for the provision of water supply, sanitation and solid waste management services. The consultants in close coordination with the with the support of PHED and other relevant stakeholders (TMAs and PHED) did profiling of all Municipal services including the identification of new and existing sources of

water supply and existing solid waste management practices. Based on this assessment, multiple proposals focusing on rehabilitation of non-operational and establishment of new tube-wells, overhead water tank, replacement of old pipelines, extension of water supply lines to new zones, solid waste management practices such as segregation at source, collection and transportation, operations and maintenance, etc.

xiv. Citizens Behaviour Communication (BCC)

BCC is the strategic use of communication approaches to promote changes in knowledge, attitudes, norms, beliefs and behaviours. The provision of physical infrastructure without associated BCC strategies may not be able to achieve the desirable goal of sustainable development.

For development of the BCC strategies to ensure that the master plan will be sustainable for a long run, the consultants conducted Perception and Behavioural Surveys of local population focusing on issues of urban responsibility using Knowledge, Attitude, and Practice (KAP) methodology based on a valid statistical sample. The purpose of the KAP surveys was to investigate the reasons for and incentives and disincentives of citizens to behave responsibly while utilizing municipal services especially their behaviour towards solid waste management, public transport usage, use of public spaces and other social services.

The identified interventions for BCC include promoting civic sense through multi-level interventions including public campaigns, digital media engagement, school outreach, and face-to-face communications. Monitoring frameworks and feedback loops are embedded to ensure measurable improvements.

xv. National and International Best Practice (references)

The preparation and implantation of master plans in Pakistan, especially in Khyber Pakhtunkhwa is not common. In the past various types of spatial plans including structure plan and master plans were prepared but these plans were never implemented even in major urban settlements. Therefore, to prepare a rational comprehensive master plan for Landi Kotal, review of the international best practices was included the study ToRs. The consultants analyzed planning laws and master plans from countries with socio-economic conditions comparable to Pakistan. The lessons drawn from this review were instrumental in shaping the proposals of the Landi

Kotal Master Plan, particularly in formulating the Multi-Criteria Analysis (MCA) methodology used for identifying suitable sites for major zones. Additionally, targeted studies of fringe areas were conducted to discourage unplanned urban sprawl and promote the conservation of prime agricultural land within the influence area of the proposed master plan.

Task C – Master Plan Strategic Scenario Development/Mapping

a. Identified suitable land parcels based on multi criteria analysis for various activities through viable projections for housing of all income groups, space required for commercial and industrial activities and other necessary component of the city.
b. Mapped existing Land use pattern and provided options for future development;
c. Identified areas having a potential for mix use development (residential, work, leisure, services etc.)
d. Identified areas suitable for infilling, intensification and redevelopment
e. Mapped the natural eco-system and environmental resources of Landi Kotal city
f. A map with detail inventory of existing features including topographical and natural constraints was developed,
g. Mapped all the wetlands, agricultural lands, aggregate resources, groundwater recharge areas, floodplains, fisheries, wildlife and environmental conservation areas.
h. Mapped the existing road and transportation network including railways and airports.
i. Prepared a detail inventory of the allied infrastructure of the Landi Kotal to support Master Plan proposals.

Task D – Preparation of Master Plan Proposals (Action Plans)

For successful implementation of the Master Plan, the consultant developed detailed and comprehensive Master Plan proposals (action plans) for various sectors of the master plan, including the following:

i) Action Plan for zoning, intensification/densification and land management.

ii) Action Plan for future housing of all income groups.
iii) Action Plan for slum up gradation/informal settlements.
iv) Action plan for health facilities
v) Action plan for educational facilities
vi) Action Plan for Quality of Life
vii) Action Plan for WATSAN and Solid Waste Management (SWM).
viii) Action Plan for Transportation and Traffic Management as well as Parking Lots
ix) Action Plan for Municipal Services.
x) Action Plan for Environmental Management, ii. Disaster Risk Reduction and iii. Emergency Planning.
xi) Action Plan for Rural Urban Fringe and Regional Development.
xii) Action Plan for Tourism Development, Cultural and Heritage Conservation /preservation
xiii) Action Plan for Economic Development, ii. Commercialization, iii. Industrialization and investment attraction.
xiv) Action Plan for Security Measures of the city
xv) Action Plan for Legal/Regulatory and Institutional Framework implementing MASTER PLAN
xvi) Action Plan for Behavioral Change Communication (BCC)Structure composition of the Report

The Landi Kotal Master Plan report is structured into three volumes along with a separate detailed report:

Volume I: Master Plan – Offers a comprehensive overview of the core strategies, proposals, and planning framework for Landi Kotal.

Volume II: Scenario/Sectoral Maps – Presents a collection of maps illustrating zoning, infrastructure networks, environmental factors, and other key spatial elements essential for urban planning.

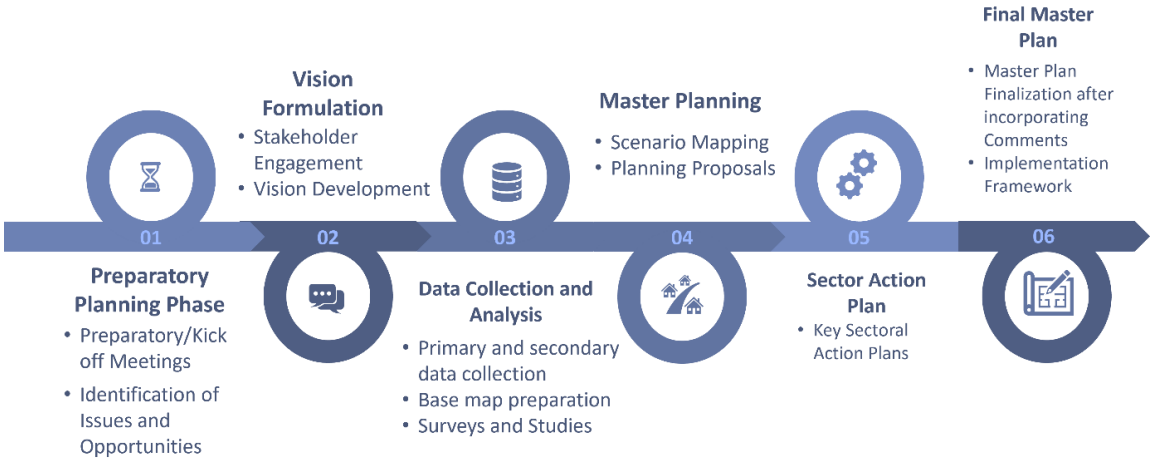
Volume III: Action Plans – Details implementation strategies, key initiatives, and step-by-step execution plans for proposed developments.

In addition, a separate Detailed Master Plan Report provides in-depth background studies, analyses, methodologies, and insights from Task C, along with relevant information from Task B.

The Landi Kotal Master Plan was developed through the following Five (05) phases:

- Preparatory Planning Phase
- Vision Formulation
- Data Collection & Analysis
- Master Planning/zoning
- Action Plans

Master Plan Methodology of Landi Kotal



Deliverables and Timelines

Sr. No	Deliverable	Timeline
1	**Inception Report** Submission of Inception Report incorporating contents and detailed methodology as well as a list of various surveys along with their questionnaires to be carried out for the MASTER PLAN preparation. The consultant has provided in the inception report a detailed work plan of all activities to enable UPU to properly monitor the activities of the consultants and ensure the completion of the project on time	At the end of 1st Month
2	**Task A: Report on Vision Development and Public Consultation** outlines the process of establishing project goals and objectives through stakeholder engagement. It documents consultations with public and private entities, including government agencies, political representatives, and the	At the end of 2nd Month

Sr. No	Deliverable	Timeline
	community. The report ensures an inclusive planning approach by incorporating technical insights, governance priorities, and public input, forming the foundation for a strategic and community-driven master plan for Landi Kotal.	
3	**Task B: Data Analysis and Background Studies** report was submitted, covering various surveys, secondary reports, relevant analyses, and associated maps. It included findings from socio-economic, land use, transportation, and environmental surveys, along with insights derived from secondary data sources. The report provided a comprehensive foundation for informed decision-making in the master planning process for Landi Kotal.	At the end of 5th Month
4	**Task C: Master Plan & Scenario Maps** The Master Plan & Scenario Maps were prepared and presented to the client and relevant implementation agencies. Following feedback received from various forums, the consultant revised the plan and provided alternative solutions where necessary to ensure effective implementation at the local level.	At the end of 9th Month
5	**Task D: Formulation of Sector Wise Action Plans** The consultant prepares Draft Sectoral Action Plans, including preliminary designs and cost estimates, for review by the client and relevant implementation agencies. Based on feedback received from various forums, the plans will be revised, and alternative proposals will be provided where necessary to ensure feasibility and effectiveness.	At the end of 13th Month
6	**Task E: Final Master Plan** The Master Planning Process followed an inclusive, iterative approach, ensuring stakeholder participation. It began with data collection through surveys, GIS mapping, and socio-economic assessments. Zoning was defined to regulate land use, including special zones for flood-prone and heritage areas. Public hearing was conducted to ensure transparency and stakeholder input, while a technical review meeting refined proposals for feasibility and policy alignment. Finally, sector-	At the end of **15th** Month

Sr. No	Deliverable	Timeline
	wise action plans were developed to guide sustainable urban growth.	

Source: Master Plan Project TORs

Methodology for Data Collection

Data was gathered from both primary and secondary sources. For Primary data collection various surveys, including Household Information Survey (HIS), Traffic and Transportation Surveys, Environmental Surveys was conducted with a structured questionnaire for each survey, and data was collected by well-trained enumerators using Android-based software. The surveys conducted for the Landi Kotal Master Plan encompassed various aspects, providing a comprehensive assessment of the area's socio-economic conditions, land use, transportation, and environmental factors. The details of each survey are as below:

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- **Household Information Survey (HIS)**

A structured questionnaire was used to collect The Household Information through a structured questionnaire consisted of various aspect of the household, including household demographics, educational status, health status, employment and income,

household facilities (availability and access), and access to and utilization of services and amenities (refer to the Inception Report for details). As per the Terms of Reference (ToR), data collection through various social and physical surveys was carried out for not less than 2% households. The data was collected throughout the urban center using the stratified random sampling techniques for developing a proper representative sample of the whole urban center.[1]

- **Land Use Survey**

A GIS-based base map (1:2000 scale) was created by digitizing a raster map from Google's satellite imagery and dividing it into grids. Android-based software was used for the detailed land use survey, conducted by trained local surveyors. The survey documented land uses, administrative boundaries, contour lines (10-meter intervals), road networks, infrastructure, civic amenities, and brownfields. To ensure accuracy, the base map integrated historical maps and remote sensing imagery and was divided into sheets for ground truthing through on-site verification. Each built-up parcel was assessed for land use, building conditions, and stories, with spatial and attribute data processed in GIS labs for analysis.

- **Transportation Survey**

Various transportation surveys, including the Origin & Destination (O&D) Survey, Traffic Count Survey, Parking Inventory Survey, and Intersection Survey, were conducted across the city. The detailed methodology, maps, and questionnaires for each survey are provided in the Background Study and Analysis Report (Volume III).

- **Environmental Survey**

Various environmental surveys, including drinking water quality, noise, air, and soil assessments, were conducted at multiple locations across the city with an EPA-approved laboratory. The detailed methodology, maps, and results of each survey are provided in the Background Study and Analysis Report (Volume – III).

[1] Let there are N Neighborhood councils, where data should be collected from the field. Then
N=N1+N2+N3+N4……Nh=∑Ni
A total of 'n' sample should be studied for analysis. The size of total sample is:
n=n1+n2+n3+…… nh=∑ni
The sample size of each Neighborhood Ccouncil is:
ni =n*Ni/N
Where: ni=sample selected from each NC, n=Total sample size, Ni=population of each NC and N=Total population of all NCs

- **Secondary Data Collection**

Secondary data was gathered from both published and unpublished government departmental data and reports, Census data, government publications, public records, historical and statistical documents, business reports, journals, and research papers, among others.

Chapter 1: Existing Land Use Spatial Pattern and Urban Form of Landi Kotal

1.1. Overview

Landi Kotal is a small town with a population of approximately 33,000 people located in the Landi Kotal tehsil of Khyber district of the Khyber Pakhtunkhwa province. Landi Kotal tehsil is bordered by Landi Kotal tehsil on the East, Yake Ghund tehsil of Momand District on the North, Muhmand Dara District of Afghanistan on the West and Bara tehsil on the South.

The town of Landi Kotal is located at 34.1186° N, 71.1567° E with an elevation of 1072m (3517.06 ft) from the mean sea level. Landi Kotal urban area is comprised of 5 neighborhood councils and 6 census blocks[2].

Landi Kotal shares boundary with Jamrud on main Grand Trunk Road N-5 towards the eastern side of the city. Most of Pakistan's trade with Afghanistan and other Central Asian countries is carried out via this route. The National Highway (N5) is Pakistan's longest highway running from Karachi to Torkham Border.

Torkham Highway is the main artery which passes through the city and connects it with Peshawar and Torkham border. Landi Kotal railway station lies near the Afghanistan border. The Landi Kotal railway station was opened in November 1925 alongside the Khyber Pass Railway's newly laid tracks between Jamrud and Landi Kotal [3]. The station building and track is depleted and damaged.

1.2. Existing Urban Form of Landi Kotal

The geography of Landi Kotal relates to the Sector Land Use Model. The 'Sector Theory' of urban land use, promulgated by American land Economist Homer Hoyt in 1939, explains that a city develops in sectors instead of rings. This urban land use model therefore focuses on arrangement of activities in an urban area as certain areas of a city are more attractive for various activities. As a city grows and these activities flourish and expand outward, they do so in a wedge and become a sector. For

[2] Provincial Election Commissioner Khyber Pakhtunkhwa. (2020). Final List of Village/Neighborhood Councils District Khyber.
[3] Can be retrieved from the link https://en.wikipedia.org/wiki/Landi_Kotal_railway_station

example, if a district is set up for high income housing, any new development in that district will expand from the outer edge[4] .

Five types of land use zones are in this model:

1. CBD Central Business District
2. Wholesale and light industry zone
3. Low class residential zone
4. Medium class residential zone
5. High class residential zone

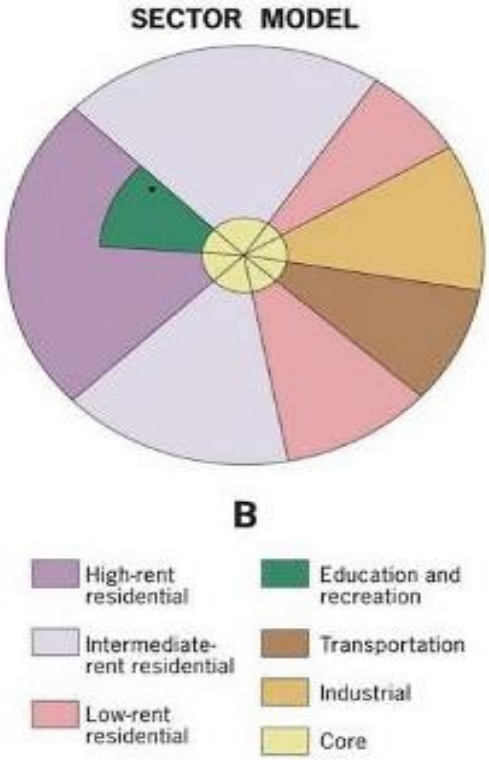


Figure 1-1: Sector Model, Homer Hoyt

Using the Sector Model, Landi Kotal has been divided into the following land use zones.

[4] ASKARI, S., BANDHOKAR, N., & BHAWE, S. (1958). General and Other. *birth*, *26*, 617-20.

1.2.1. Zone “A” Commercial & Civic Zone Along National Highway

This zone is comprised of high commercialized area and public land uses. These include civil hospital, main commercial area, bus terminal, and railway station etc. Most of these facilities are located along N-5 road. This zone is in form of sector.

Figure 1-2: Zone A (Civic Zone)

1.2.2. Zone “B” Restricted Area

This zone covers the town’s most developed area and is situated along the National Highway-5. It includes the public buildings such as Police station, Station Officer Mess, CMH, Khyber Rifles and another public sector office.

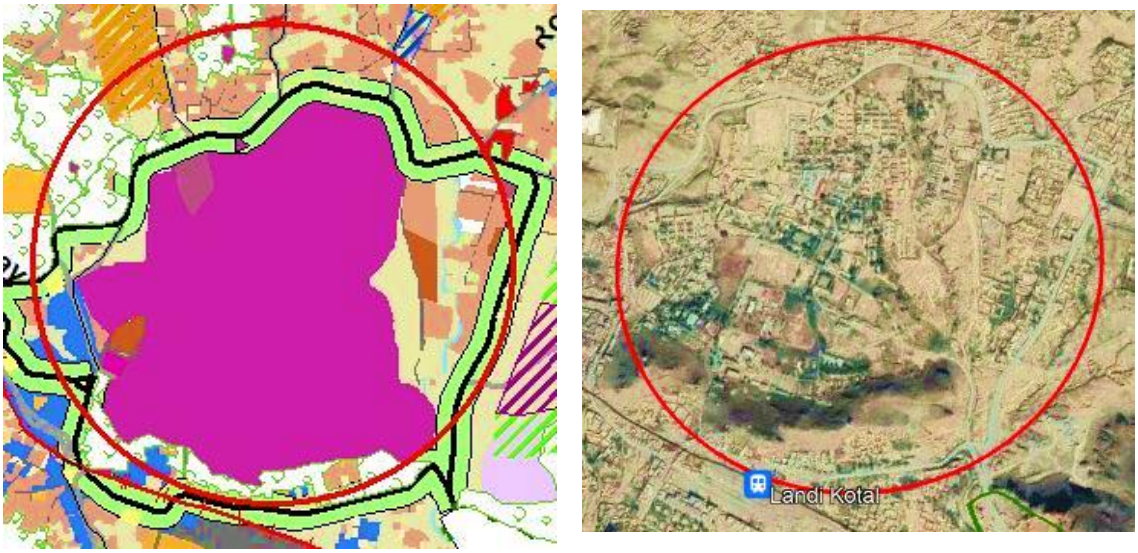


Figure 1-3: Zone B (Restricted Area)

1.2.3. Zone “C” Residential Area

This zone includes housing colonies, scattered all over the town. This zone is served by several important roads of the town such as Khyber Agency Road, Landi Kotal Bypass Road, National Highway N-5. Notable residential areas of this zone include are: Kando Khel, Ishaq Khel, Ashraf Khel, and Gulab Kili etc.

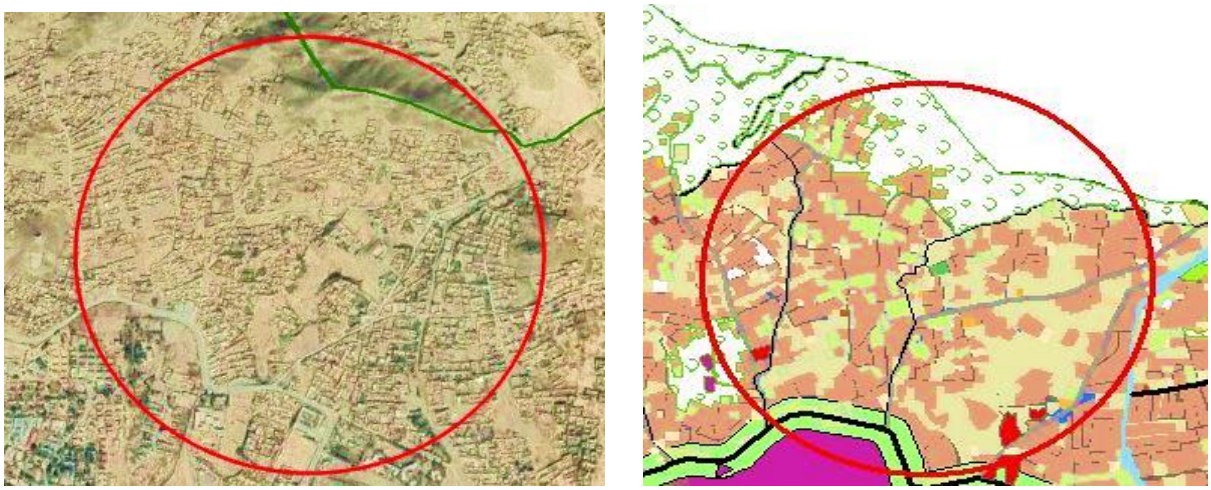


Figure 1-4: Zone C (Residential Area)

1.3. The Pros and Cons of Hoyt sector model

Table 1-1 outlines the pros and cons of the sector model to provide a better picture of Landi Kotal’s existing urban form relation with the model.

Table 1-1: Pros and Cons of Sector Land Use Model

Pros	Cons
It looks at the effect of transport and communication links.	There is no reference to out of town development.
Numerous cities seem to have followed this model.	There is no reference to the physical environment.
Pie shaped wedges made by Hoyt compensated for the drawbacks of the Ring model.	The theory is based on nineteenth century transport and does not make allowances for private cars that enable commuting from cheaper land outside city boundaries.
Though not perfect, it considers the lines of growth.	
It allows for an outward progression of growth.	

The distinctiveness and eminence of the existing urban center needs to be maintained or enhanced in the future plan. It is recommended that the existing neighborhood councils be considered for urbanization.

In order to confine the future urban development of Landi Kotal urban center, it is suggested to convert prospective Village Councils into Neighborhood Councils based on their characteristics. This way, the interconnection of radial roads with the National Highway around the existing city will keep the development compact and avoid haphazard development. Compact development is promoted to give maximum benefit to the people.

The phenomenon of ribbon development (The establishment of houses in a continuous row along the main road) is a critical issue in urban growth. Due to the improvement of road connectivity and the rise of traffic, people tend to build houses, shops and factories near highways and roads for better business and transportation.

In particular Landi Kotal By-Pass and National Highway N-5 is subject to significant ribbon development along both its sides, and exhibits large public land uses such as commercial, industrial, educational institutes and other uses. The figure showing linear pattern is given below.

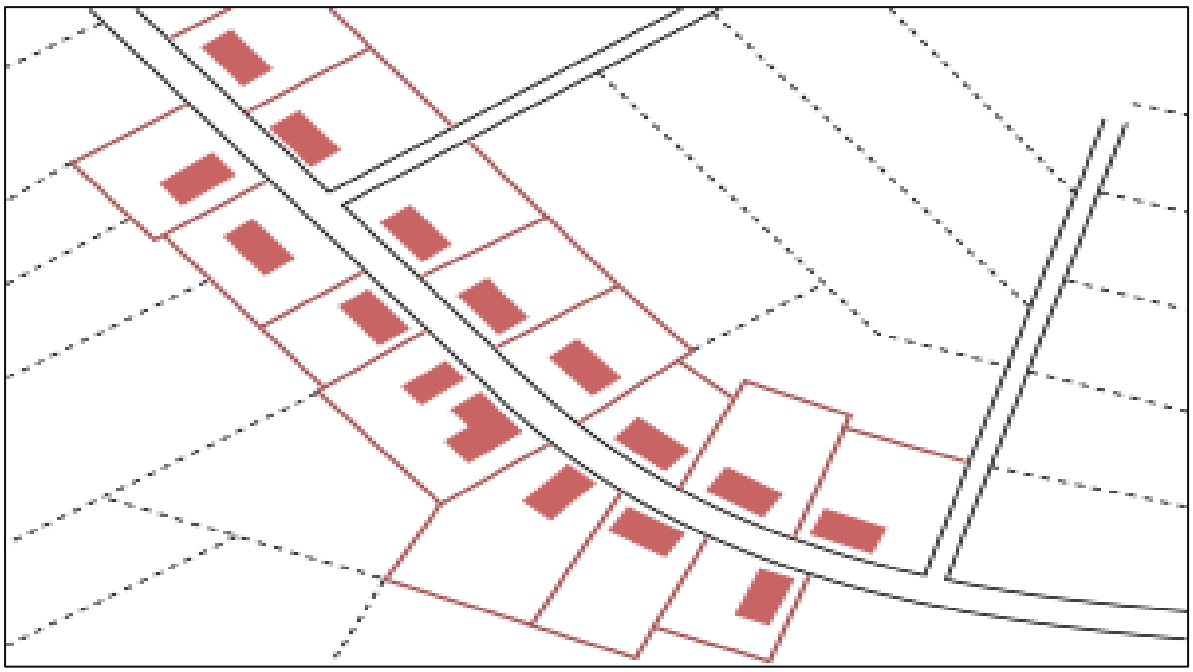


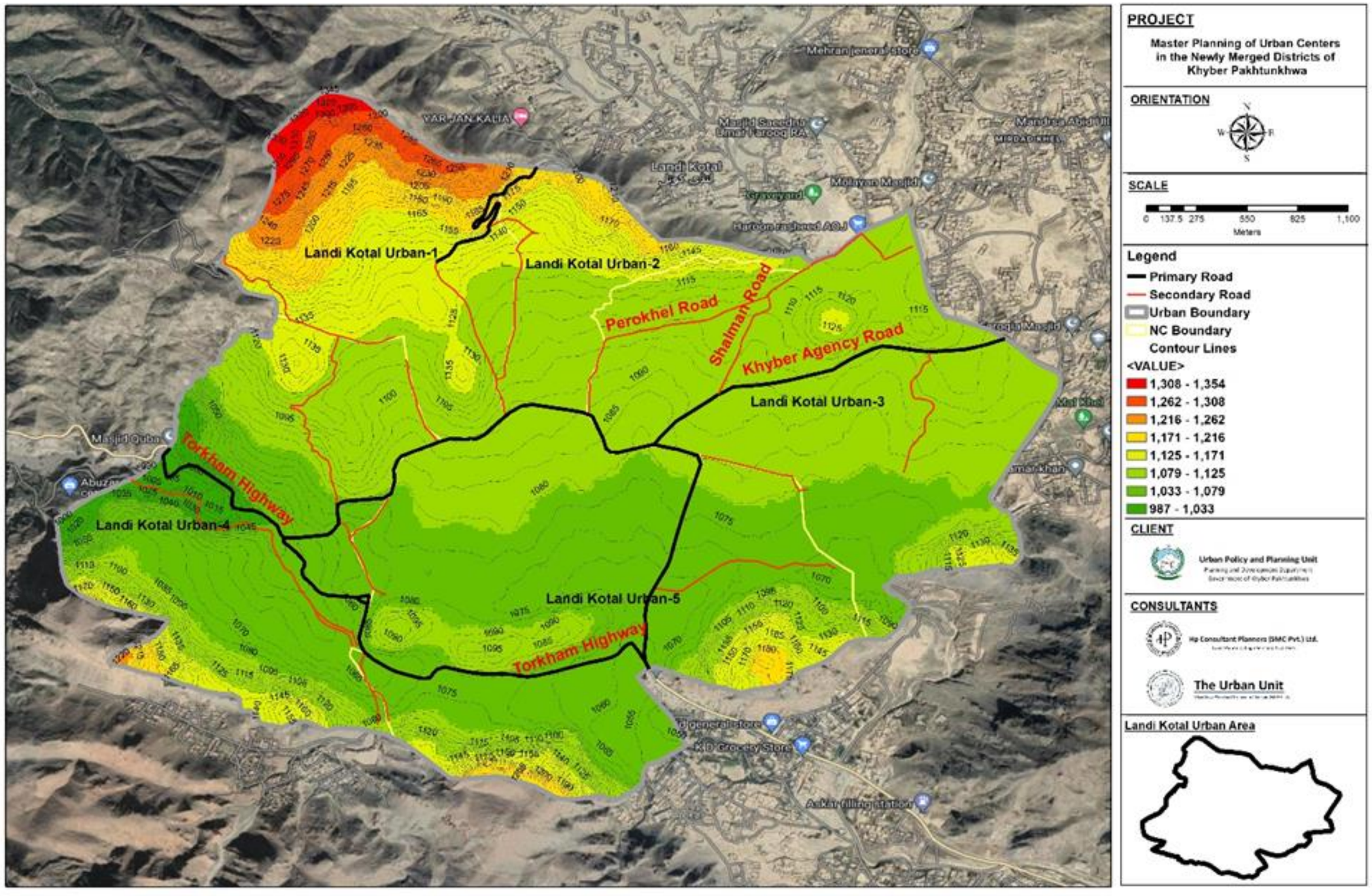
Figure 1-5 Linear Development

Table 1-2: Pros and Cons of Linear Development

Pros	Cons
Flexibility and openness for growth	Unnecessarily long distances to be travelled daily
All structures are close to the main line and easily accessible in terms of time or effort, taking into account the transport efficiency	Infrastructure development more expensive

1.4. Contour Map

A contour map has been prepared with contour lines drawn at 500-meter intervals. The general slope of the Landi Kotal urban center moves from Northwest with the highest elevation point at 1,354 meters and the lowest point at 987 meters towards the south. The 367- meter difference in contour levels from North to South suggests that the terrain of the Landi Kotal urban center is relatively mild slope.



Map 1: Contour Map (500- meter intervals), Landi Kotal

Source: Google Earth (2022), resolution 1000 dpi

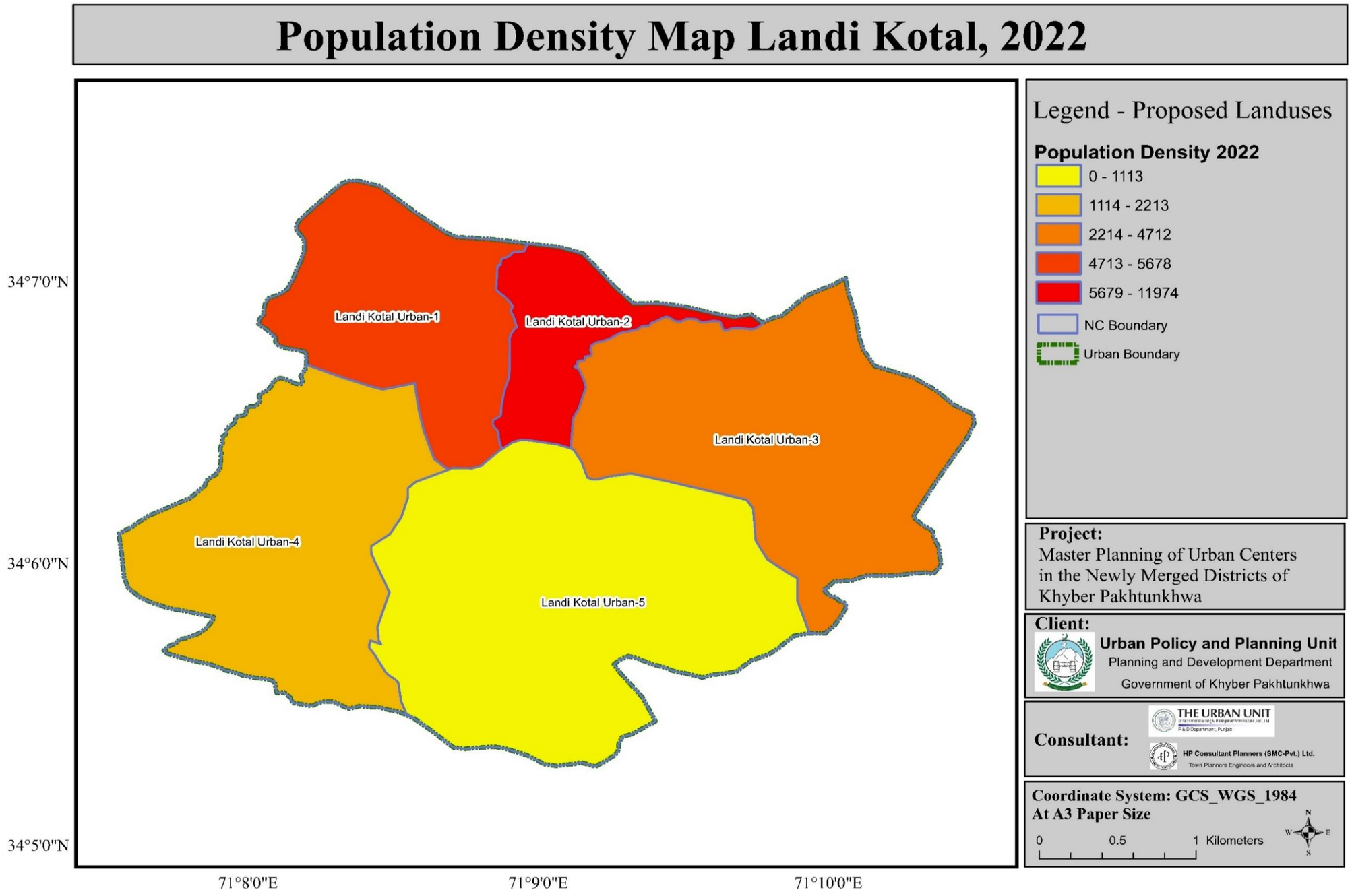
1.5. Population Density

According to the Bureau of Statistics Report 2017; the population of Landi Kotal Tehsil is 273,052 and out of this figure 239,323 population are declared as rural while 33,729 population declared as urban, whereas in 2020 the Provincial Election Commissioner Delimitation Committee published a final list of village/ Neighborhood councils and declared five NC'S included 6 blocks as the urban center which makes a total population of approximately 33,697.

Table 1-3: Population Densities of all NCs of Landi Kotal

Neighborhood council	Population (2017)	Population (2022)	Area (sq. km)	Density 2017 (pop per sq. km)	Density 2022 (pop per sq. km)
Landi Kotal 1	7,696	8574	1.51	5,097	5678
Landi Kotal 2	7,309	8,142	0.68	10,749	11,974
Landi Kotal 3	10,776	12,204	2.59	4,161	4,712
Landi Kotal 4	4,589	5,112	2.31	1,986	2,213
Landi Kotal 5	3,327	3,706	3.33	999	

Source: The Urban Unit and HP Consultants



Map 2: Population Density Map, 2022

Source: The Urban Unit

1.6. Land Use Classification Map

The government of Khyber Pakhtunkhwa on 24 November 2021 passed “The Khyber Pakhtunkhwa Land-use and Building control, Act 2021”. Under this, the following shall be formed:

- Provincial Land use and Building Control Council,
- Land Use and Building Control Authority

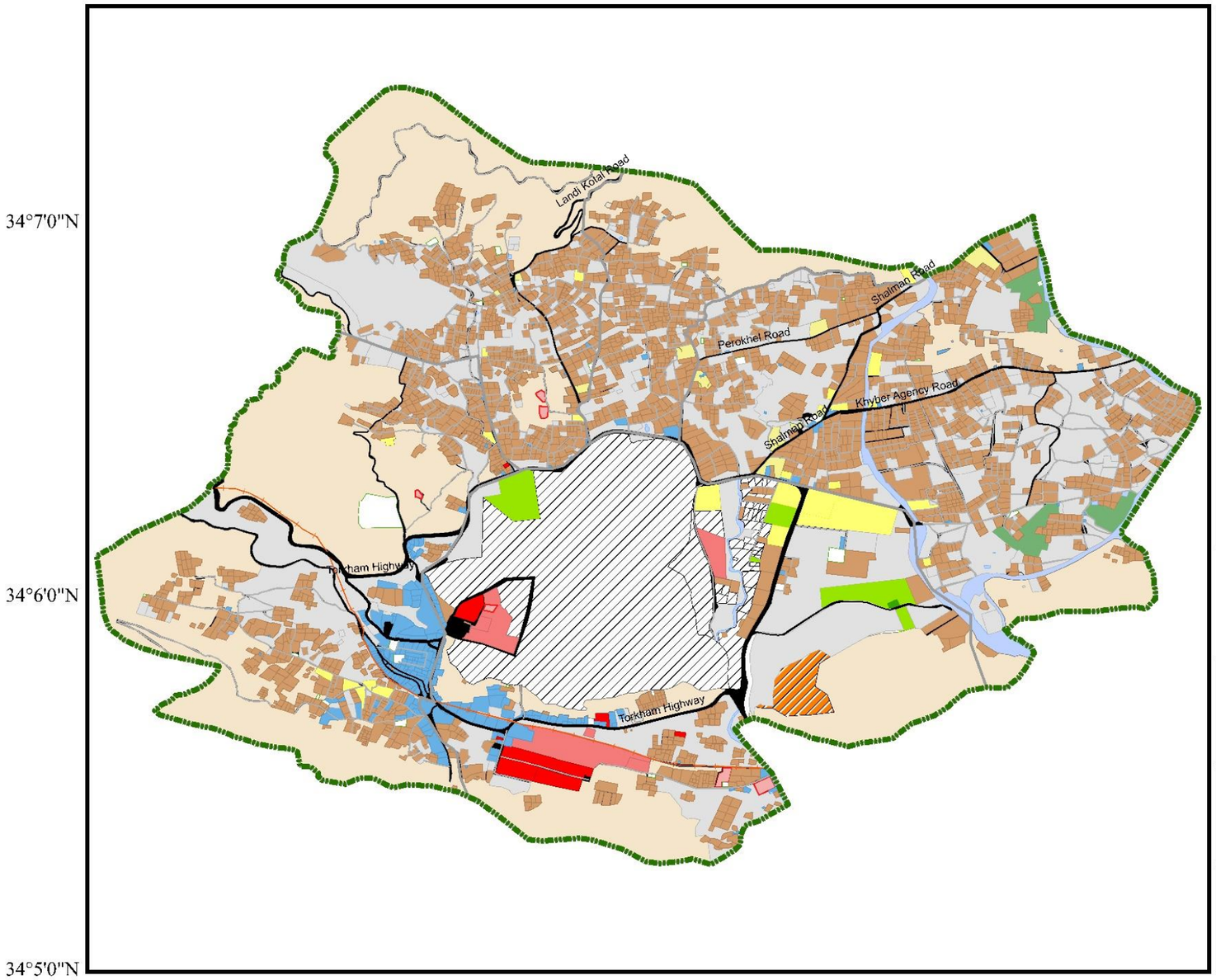
The functions of Provincial Land-use and building control council includes approval of Master plans and district land use plans. Provincial land-use and building control authority shall perform the functions of supervision of district land use and management committee and proposing planning standards to Provincial land use and building control councils for the approval. The district land use and management committee will perform the functions of preparing master plans and district land use plan with the help of concerned local government. The local planning and enforcement will provide support to the district land use and management committee. The existing land uses of Landi Kotal are categorized as per subsection (3) of section 15 of Land use and Building Control Act 2021, which are as follows:

- Residential area
- Commercial area
- Industrial area
- Forest, national park, range land and other related areas
- Mining areas (if exists)
- Agricultural area (irrigated, barren and fallow etc.)
- Concentrated public sector area
- Recreational area
- Mixed land use areas
- Barren and vacant land (to be further classified as culturable waste land or otherwise).
- Water bodies
- Area prone to natural hazard

The land use classification is explained in the KP Land use and Building Control Act 2021; however, no specific percentages are given under which certain land use or master plans shall be prepared. Thus, the consultants have prepared the existing and

proposed land use base map Landi Kotal using NRM standards. Moreover, on the basis of existing land uses of Landi Kotal and current population, future population for 2040 is projected along with it proposed future land uses. The proposed land use map of Landi Kotal 2040 contains all the above-mentioned land uses calculated on the basis of existing land uses and projected land use proportion as mentioned in table above to fill the gap and fulfill the future need of the people. Below table and map shows the land use categories as per the Land Use and Building Control Act, 2022.

Existing Land Use of Landi Kotal



Legend

Rail Track | Primary Road | Secondary Road | Street
Urban Boundary | NC Boundary

Land Uses	Area (Sq. Km)	Percentage
Residential	2.29	21.96%
Commercial	0.23	2.18%
Industrial	0.00	0.00%
Public Buildings		
Education	0.13	1.29%
Health	0.06	0.59%
Religious	0.05	0.46%
Security	0.01	0.14%
Others	0.11	1.07%
Recreational Facilities		
Parks	0.09	0.89%
Sports Complex	0.001	0.01%
Agricultural	0.07	0.70%
Barren/Vacant Land	2.27	21.77%
Range Land/Forest/Others	3.08	29.51%
Mining Area	0.06	0.53%
Restricted Area	1.17	11.17%
Graveyard	0.04	0.38%
Water Bodies	0.16	1.54%
Transportation	0.61	5.81%
Total	**10.43**	**100%**

Project:
Master Planning of Urban Centers in the Newly Merged Districts of Khyber Pakhtunkhwa

Client:
Urban Policy and Planning Unit
Planning and Development Department
Government of Khyber Pakhtunkhwa

Consultant:
THE URBAN UNIT
HP Consultant Planners (SMC-Pvt.) Ltd.
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Coordinate System: GCS_WGS_1984
At A3 Paper Size

0 0.5 1 Kilometers

Map 3: Existing Land Use Base Map of Landi Kotal

Source: The Urban Unit

In addition to the land use classifications above, below table compares the existing land use percentages with the NRM standards in order to demonstrate the gaps and calculate future land use requirements.

Table 1-4: Landi Kotal Land Use Classification Map[5]

Land Use		Area (Sq. Km.)	Percentage %	NRM Standards	
Residential		2.29	21.96%	Residential	27%-43%
Commercial		0.23	2.18%	Commercial	1%-5%
Industrial		0.00	0.00%	Industrial	2%-20%
Public Buildings	Education	0.13	1.29%	Institutional	3%-11%
	Health	0.06	0.59%		
	Religious	0.05	0.46%		
	Security	0.01	0.14%		
	Others	0.11	1.07%		
Recreational Facilities	Parks	0.09	0.89%	Recreational	1%-6%
	Sports Complex	0.001	0.01%		
Agricultural		0.07	0.70%		
Barren/Vacant Land		2.27	21.77%	Vacant Land	8%-26%
Range Land/Forest		3.08	29.51%		
Mining Area		0.06	0.53%		
Restricted Area		1.17	11.17%		
Graveyard		0.04	0.38%	Graveyard	0.5%-6%
Water Bodies		0.16	1.54%		
Transportation		0.61	5.81%	Transportation	3%-27%
Total		**10.43**	100.00%		

It is observed that the percentages of all built up land uses like; residential, commercial, industrial,institutional, recreational, graveyard and circulation are low, while protected / reserved is high, incomparison to the NRM Standards. Therefore, for future land use

[5] Calculated from GIS base map

proposal, the area deficiency in each land use classification, is balanced from the excess area of protected /reserved and vacant land.

The future land use proposal can therefore address the area deficiencies in each land use classification and utilize those areas of range, vacant land, agricultural lands that are in excess.

1.6.1. Existing Land Use Classification in NCs

Landi Kotal is comprised of 5 Neighborhood Councils:

- Landi Kotal-1
- Landi Kotal-2
- Landi Kotal-3
- Landi Kotal-4
- Landi Kotal-5

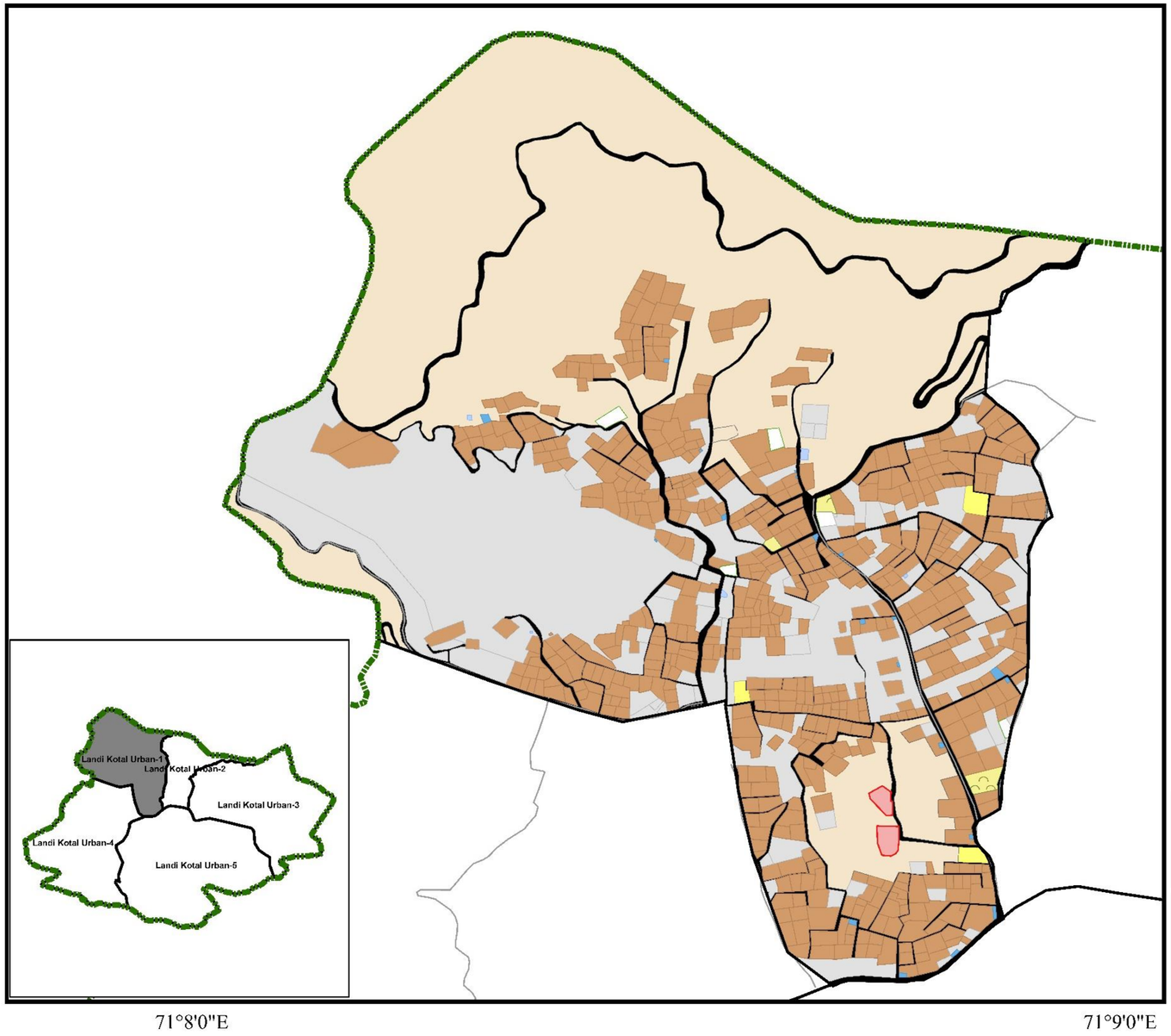
Table 1-5 and Maps 4 - 8 summarize the existing land usage in each NC in Landi Kotal.

Table 1-5: Landi Kotal Neighborhood Council Level Land Use Statistics

Neighbourhood Council		Landi Kotal-1	Landi Kotal-2	Landi Kotal-3	Landi Kotal-4	Landi Kotal-5	Total
Population (People)		7696	7309	10776	4589	3327	33697
Census Blocks		2	1	1	1	1	6
Land Uses		**Area (Sq.km)**					
Residential		0.40	0.26	1.00	0.38	0.25	2.29
Commercial		0.002	0.01	0.01	0.13	0.08	0.23
Industry		0.00	0.00	0.00	0.00	0.00	0.00
Public Buildings	**Education**	0.004	0.003	0.02	0.02	0.09	0.13
	Health	0.00	0.00	0.00	0.0004	0.06	0.06
	Religious	0.004	0.0004	0.005	0.03	0.01	0.05
	Security	0.003	0.00	0.00	0.001	0.01	0.01
	Others	0.00	0.00	0.00	0.00	0.11	0.11
	Sub-Total Public Buildings	0.011	0.003	0.03	0.05	0.28	0.37
Recreational Facilities	**Parks**	0.00	0.00	0.00	0.00	0.09	0.09
	Sports Complex	0.00	0.00	0.00	0.00	0.001	0.001
Agricultural		0.00	0.00	0.07	0.00	0.0002	0.07
Barren/Vacant Land		0.35	0.13	0.85	0.36	0.58	2.27
Range Land/Forest		0.65	0.24	0.28	1.26	0.65	3.08
Mining Area		0.00	0.00	0.00	0.00	0.06	0.06
Restricted Area		0.00	0.00	0.00	0.00	1.17	1.17
Graveyard		0.004	0.005	0.03	0.00	0.00	0.04
Water Bodies		0.001	0.001	0.13	0.0003	0.03	0.16
Transportation		0.09	0.04	0.19	0.13	0.14	0.61
Total		1.51	0.68	2.59	2.31	3.33	10.43

Source: Land Use Survey, 2021

Existing Land Use (Landi Kotal Urban Area 1)



Legend

Rail Track | Primary Road | Secondary Road | Street | Urban Boundary | NC Boundary

Land Uses	Area (Sq. Km)	Percentage
Residential	0.40	26.21%
Commercial	0.002	0.11%
Industrial	0.00	0.00%
Public Buildings		
Education	0.004	0.27%
Health	0.00	0.00%
Religious	0.004	0.25%
Security	0.003	0.22%
Others	0.00	0.00%
Recreational Facilities		
Parks	0.00	0.00%
Sports Complex	0.00	0.00%
Agricultural	0.00	0.00%
Barren/Vacant Land	0.35	23.42%
Range Land/Forest/Others	0.65	43.00%
Mining Area	0.00	0.00%
Restricted Area	0.00	0.00%
Graveyard	0.004	0.24%
Water Bodies	0.001	0.03%
Transportation	0.09	6.24%
Total	**1.51**	**100%**

Project:
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Planning and Development Department
Government of Khyber Pakhtunkhwa

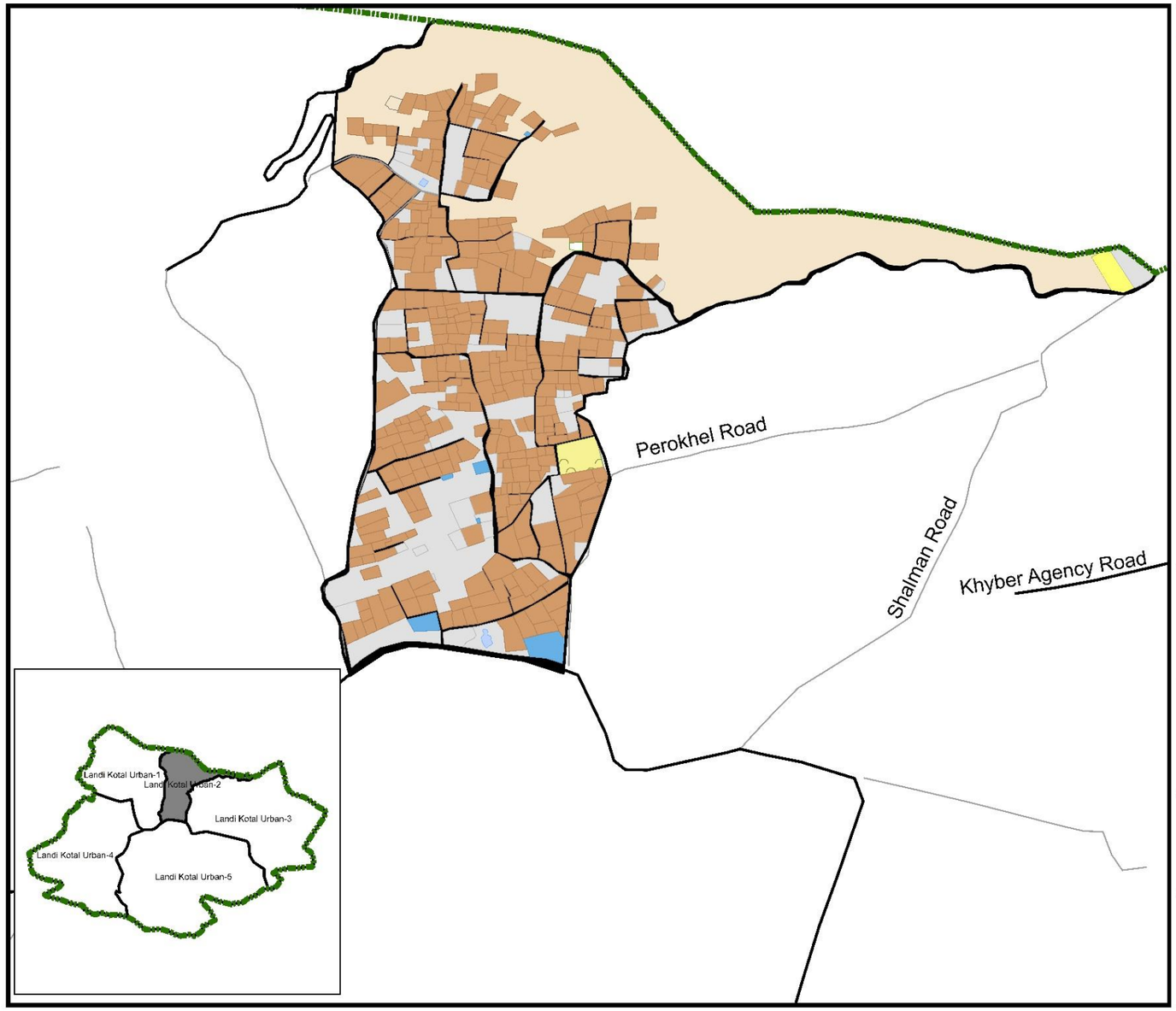
Consultant:
THE URBAN UNIT
HP Consultant Planners (SMC-Pvt.) Ltd.
Town Planners Engineers and Architects

Coordinate System: GCS_WGS_1984
At A3 Paper Size
0 0.2 0.4 Kilometers

Map 4: Existing Land Uses in Landi Kotal 1 NC

Source: The Urban Unit

Existing Land Use (Landi Kotal Urban Area 2)



Legend

Rail Track | Primary Road | Secondary Road | Street | Urban Boundary | NC Boundary

Land Uses	Area (Sq. Km)	Percentage
Residential	0.26	26.21%
Commercial	0.01	0.11%
Industrial	0.00	0.00%
Public Buildings		
Education	0.003	0.27%
Health	0.00	0.00%
Religious	0.004	0.25%
Security	0.00	0.22%
Others	0.00	0.00%
Recreational Facilities		
Parks	0.00	0.00%
Sports Complex	0.00	0.00%
Agricultural	0.00	0.00%
Barren/Vacant Land	0.35	23.42%
Range Land/Forest/Others	0.65	43.00%
Mining Area	0.00	0.00%
Restricted Area	0.00	0.00%
Graveyard	0.004	0.24%
Water Bodies	0.001	0.03%
Transportation	0.09	6.24%
Total	**1.51**	**100%**

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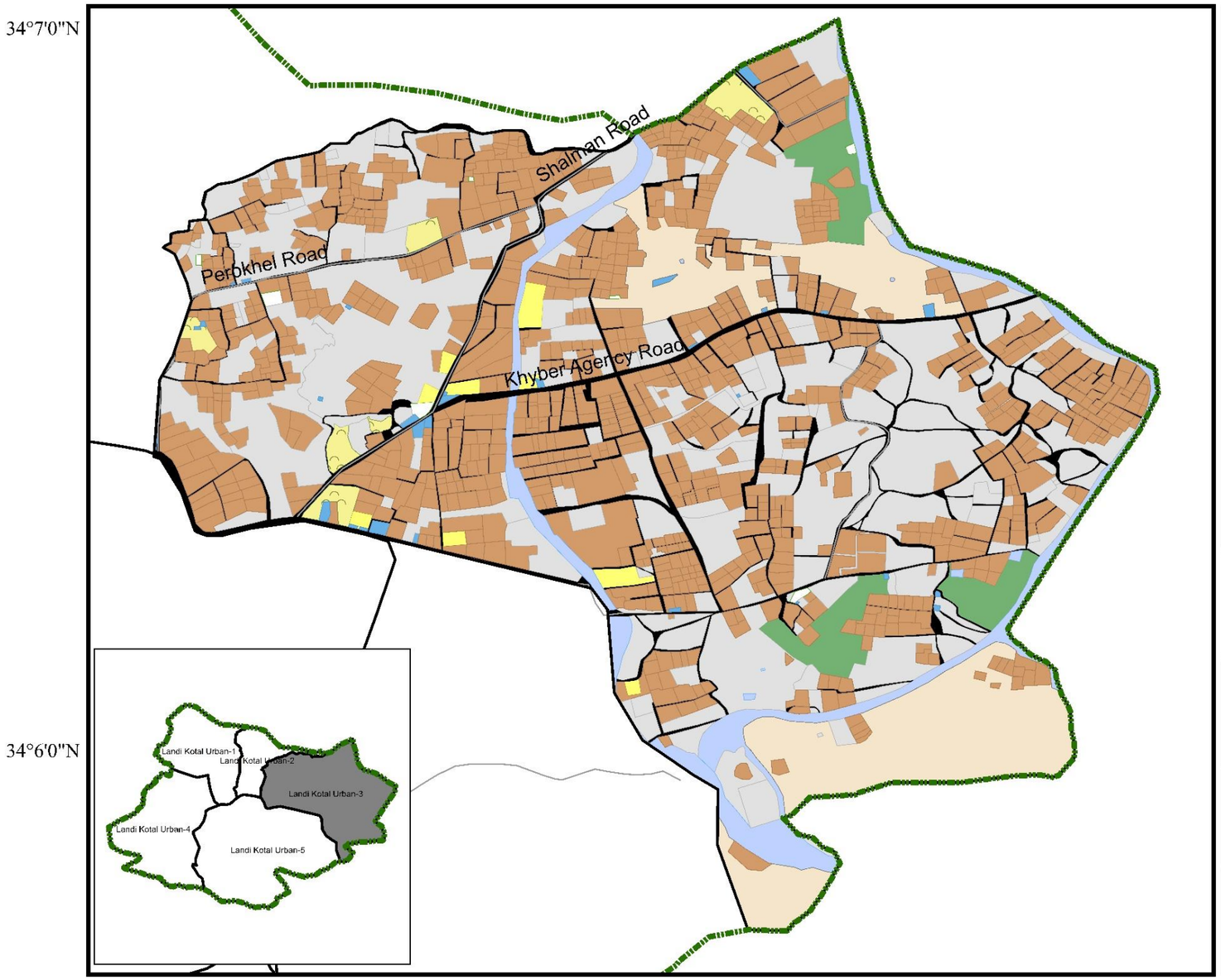
At A3 Paper Size
0 0.2 0.4 Kilometers

Map 5: Existing Land Uses in Landi Kotal 2 NC

Source: The Urban Unit

Existing Land Use (Landi Kotal Urban Area 3)



Legend

Rail Track | Primary Road | Secondary Road | Street | Urban Boundary | NC Boundary

Land Uses	Area (Sq. Km)	Percentage
Residential	1.00	38.58%
Commercial	0.01	0.39%
Industrial	0.00	0.00%
Public Buildings		
Education	0.02	0.78%
Health	0.00	0.00%
Religious	0.005	0.18%
Security	0.00	0.00%
Others	0.00	0.00%
Recreational Facilities		
Parks	0.00	0.00%
Sports Complex	0.00	0.00%
Agricultural	0.07	2.83%
Barren/Vacant Land	0.85	32.84%
Range Land/Forest/Others	0.28	10.75%
Mining Area	0.00	0.00%
Restricted Area	0.00	0.00%
Graveyard	0.03	1.21%
Water Bodies	0.13	5.08%
Transportation	0.19	7.35%
Total	**2.59**	**100%**

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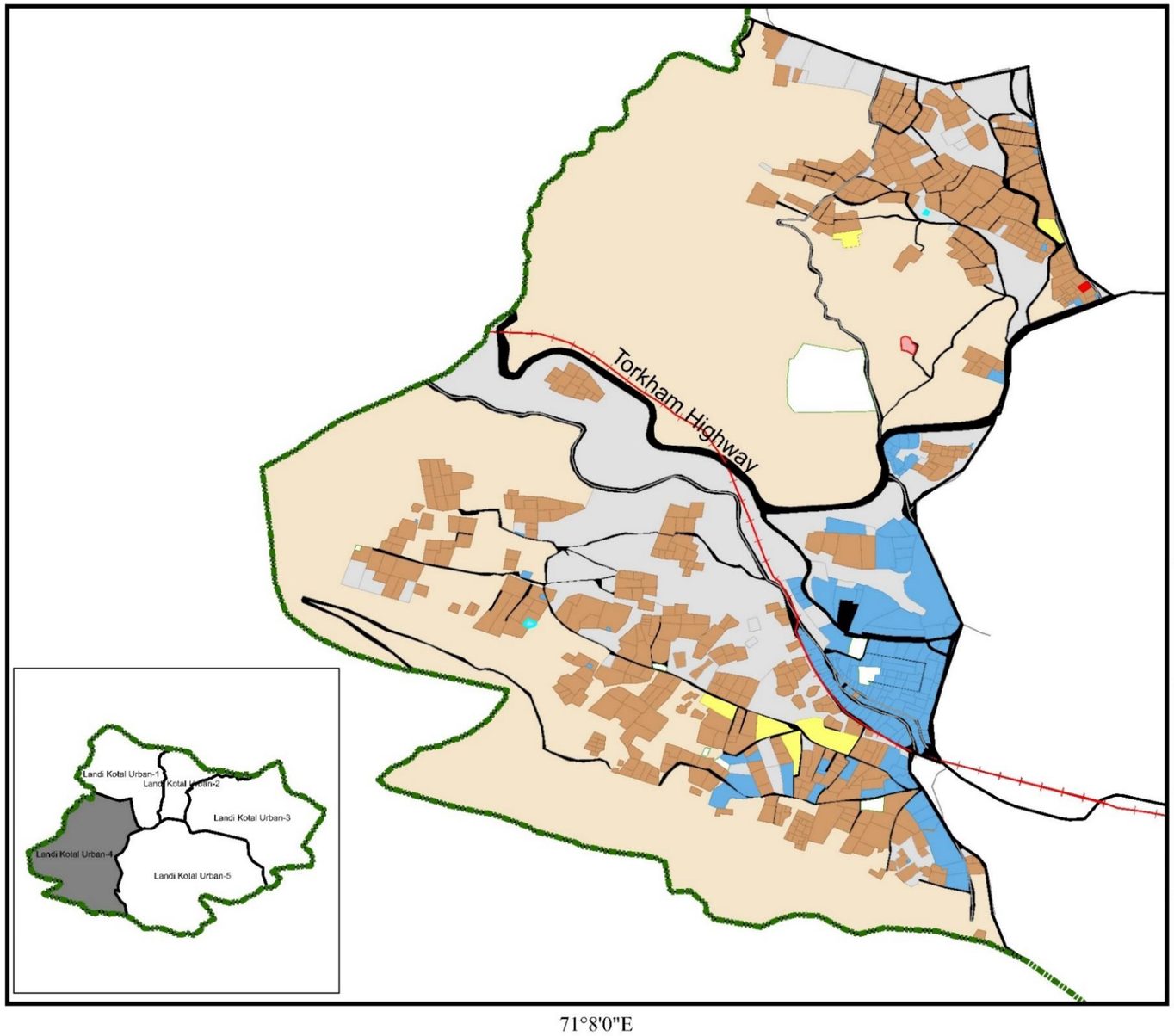
At A3 Paper Size
0 0.25 0.5 Kilometers

Map 6: Existing Land Uses in Landi Kotal 3 NC

Source: The Urban Unit

Existing Land Use (Landi Kotal Urban Area 4)



Legend

Rail Track | Primary Road | Secondary Road | Street
Urban Boundary | NC Boundary

Land Uses	Area (Sq. Km)	Percentage
Residential	0.38	16.50%
Commercial	0.13	5.49%
Industrial	0.00	0.00%
Public Buildings		
Education	0.02	0.72%
Health	0.0004	0.02%
Religious	0.03	1.34%
Security	0.001	0.04%
Others	0.00	0.00%
Recreational Facilities		
Parks	0.00	0.00%
Sports Complex	0.00	0.00%
Agricultural	0.00	0.00%
Barren/Vacant Land	0.36	15.64%
Range Land/Forest/Others	1.26	54.43%
Mining Area	0.00	0.00%
Restricted Area	0.00	0.00%
Graveyard	0.00	0.00%
Water Bodies	0.0003	0.01%
Transportation	0.13	5.82%
Total	2.31	100%

Project:
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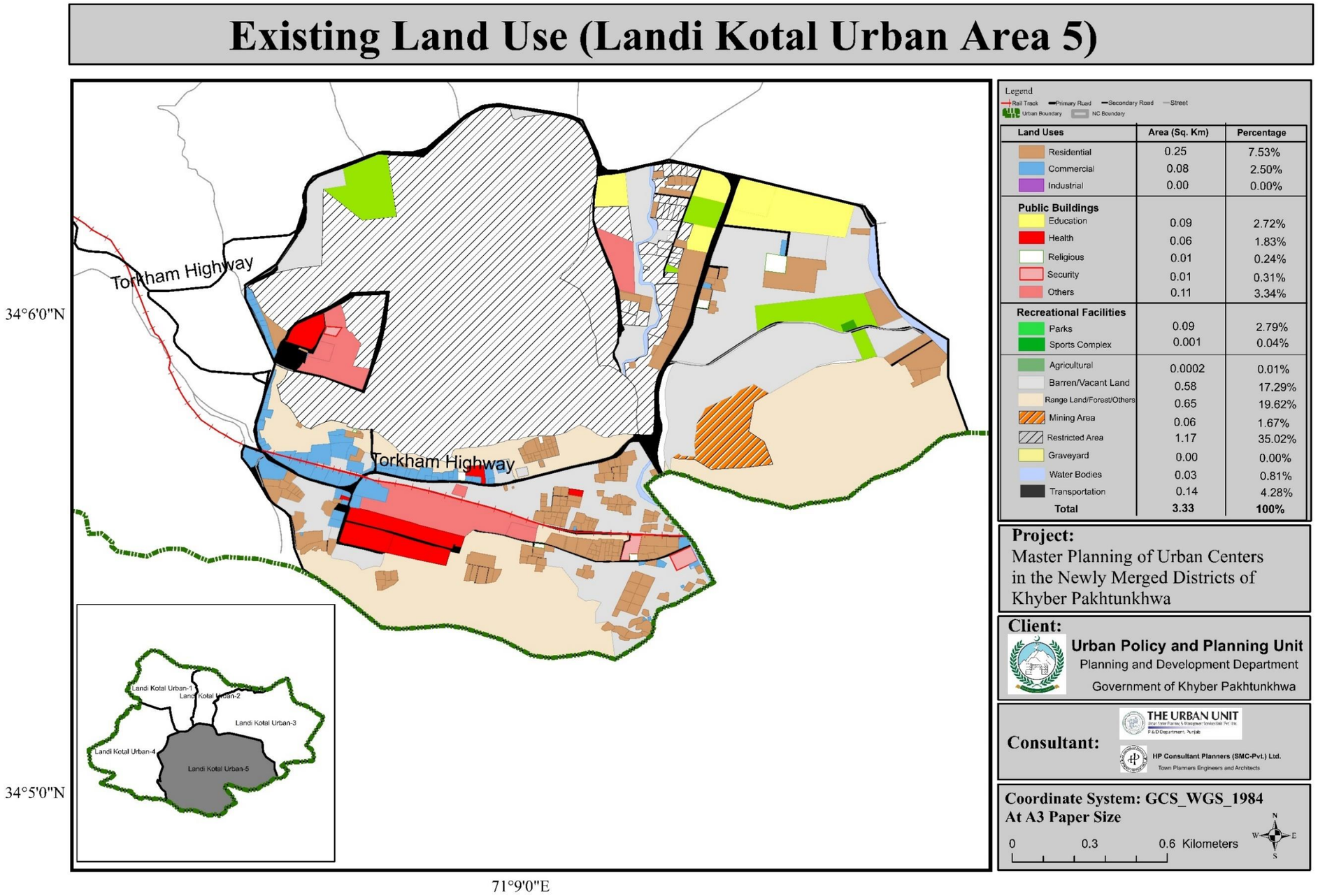
Coordinate System: GCS_WGS_1984
At A3 Paper Size
0 0.25 0.5 Kilometers

Map 7: Existing Land Uses in Landi Kotal 4 NC

Source: The Urban Unit



Map 8: Existing Land Uses in Landi Kotal 5 NC

Source: The Urban Unit

Chapter 2: Multi Criteria Analysis

Urban development is based on different benchmarks such as availability of resources, amenities, land uses and other services. Availability of resources are vital in the development of urban areas while amenities and land use also define the current use of land and how they can be planned for the coming years. The scenario development approach is employed for the future planning of the Landi Kotal Urban Center. These scenarios inform the planning and development process while exploring all potentials, weaknesses, opportunities and constraints of Landi Kotal.

The scenario development and suitability analyses have been prepared for different sectors including residential, commercial, industries, health and education. Using the survey-based studies as in the Background Studies and Analysis report, the suitable land has been determined for the planning horizon. GIS was used to prepare Land suitability Maps for different sectors according to the Multi criteria analysis methodology, a technique used to consider multiple criteria when analyzing an area's suitability for different uses.

For the multi-criteria analysis, all the existing land use layers were first converted to a projected coordinate system (Universal Transverse Mercator (UTM) zone 43N). Next, existing built up areas, water bodies, and preserved agriculture lands were set as constraint areas, and the remaining lands are used for proposing suitable land uses for Landi Kotal Urban Center. Figure 2-1 illustrates the removal of constrained areas and the resulting 5.44 sq. km. of land available for future development in Landi Kotal.

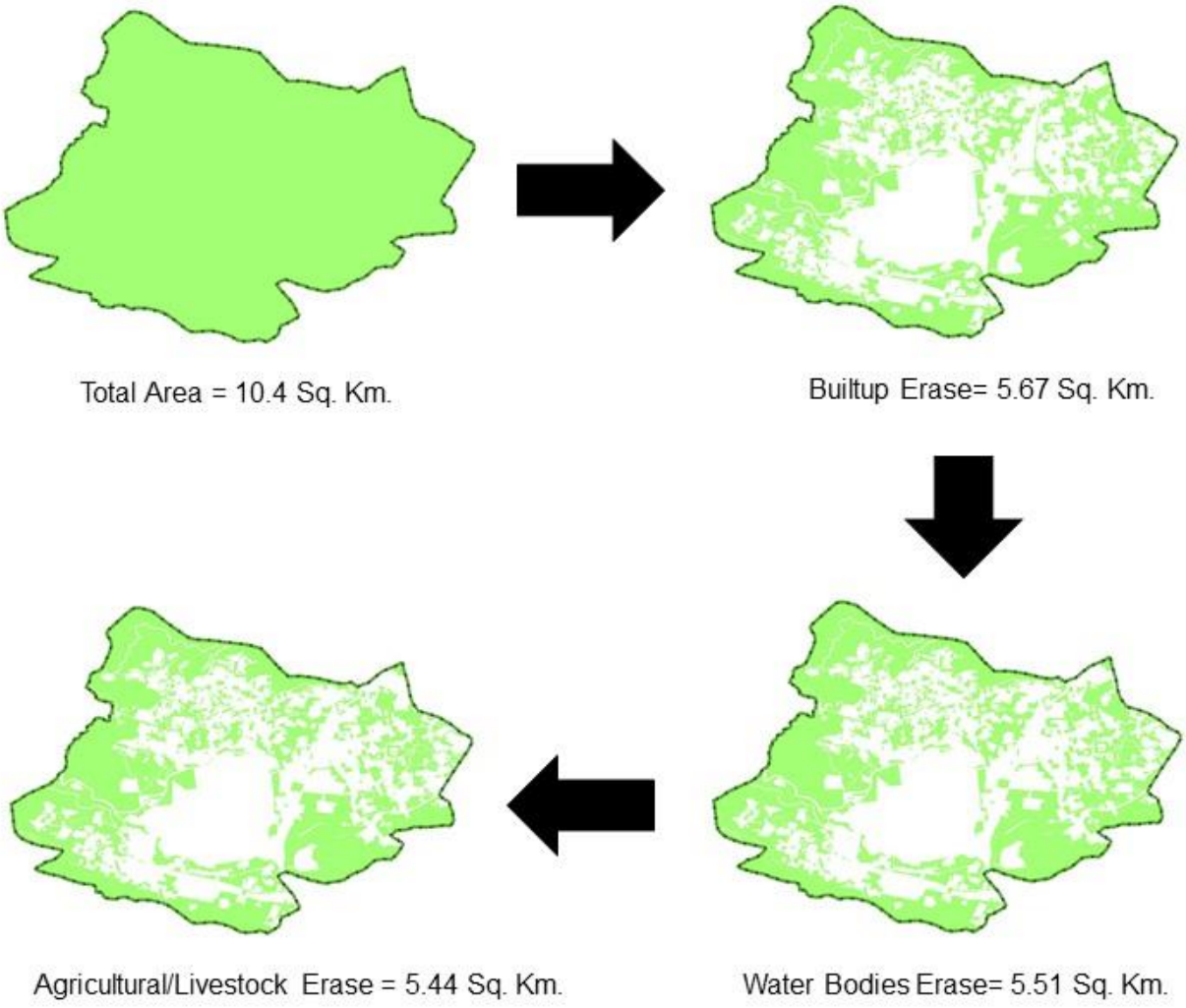


Figure 2-1: Constraint Areas in Landi Kotal Urban Center

Adjacent agricultural land to contiguous build-up converts to other land uses, such as residential and commercial, because 100% of agricultural land cannot be maintained for use in agriculture due to future city expansion. Therefore, by 2040, the 0.07 sq.km of remaining agricultural land will be protected and considered as a development constraint.

As finalized with the UPPU, the land suitability analysis has been conducted for the following sectors:

- Residential,
- Commercial,
- Industrial, and
- Landfill site

Each sector is described along with its suitability criteria in the following sections:

2.1. Commercial

First, the main commercial hub was isolated from the proposed residential areas. Euclidean tool was used for the existing built-up areas.

The scoring system for the land suitability for Commercial areas is provided in Table 2-1. In general, lower weights mean less considerable areas whereas higher weight values mean more considerable areas.

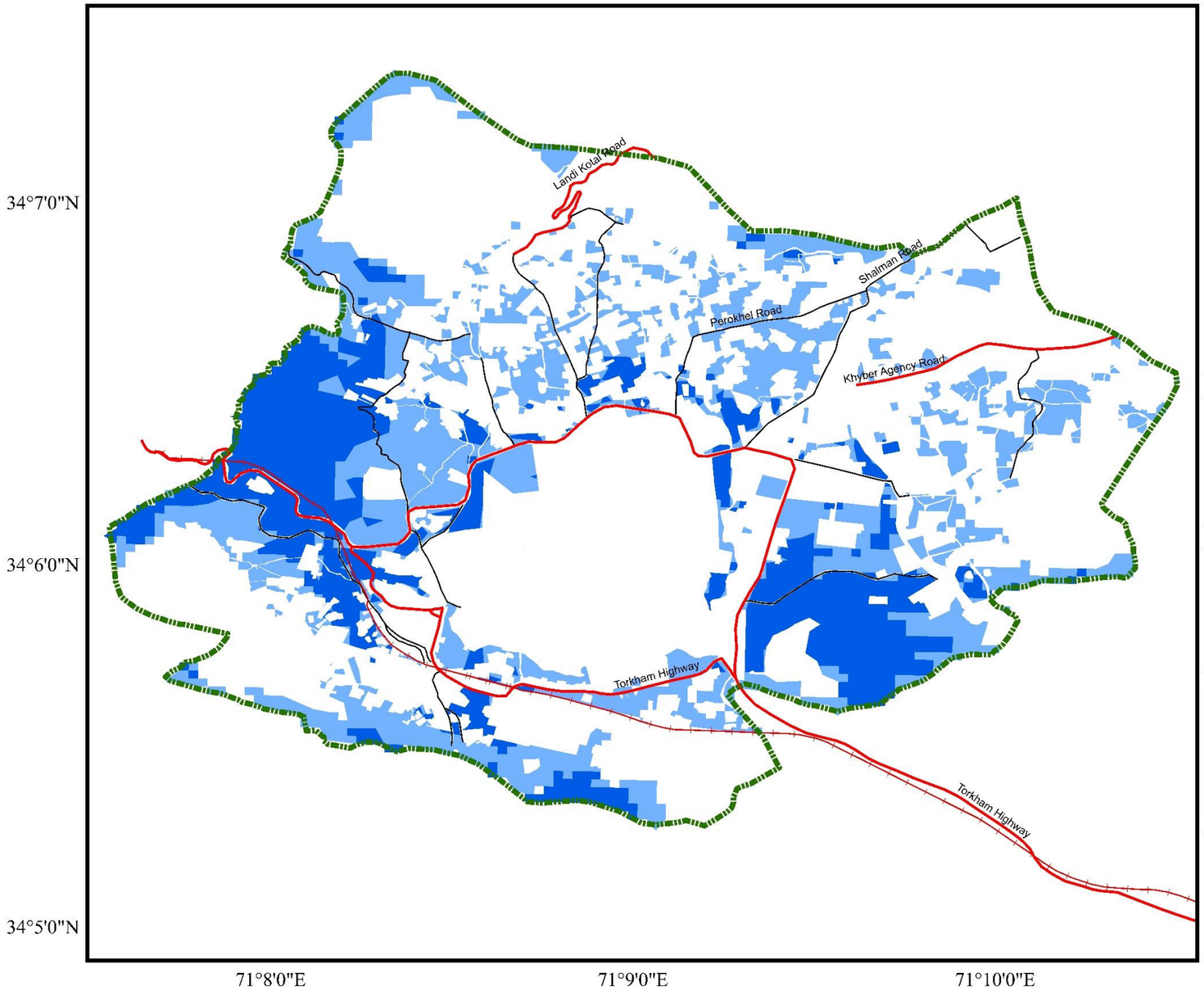
Similarly, the layer of existing built-up areas was reclassified. Areas within walking distance of existing built-up were given higher values and weightages while areas away from built-up areas were given lower values. The values assigned to different layers are based on the requirement of each land use.

Table 2-1 Multi Criteria Analysis Commercial Development

S. No	Parameters/Layers	Influence (Total = 100)	Classes (In meters/degree/PKR)	Weights 0-1 = Least 2 = Moderate 3-4 = Highly
1	Primary road	15	17-250	4
			251-500	3
			501-750	2
			751-1000	1
			Above 1000	0
			17-200	4

S. No	Parameters/Layers	Influence (Total = 100)	Classes (In meters/degree/PKR)	Weights 0-1 = Least 2 = Moderate 3-4 = Highly
2	Secondary road	5	201-400	3
			401-600	2
			601-800	1
			Above 800	0
3	Land Cover	20	Vacant land	1
			Barren land	2
4	Land Value Rs. Per Marla	10	30000-400000	0
			400001-800000	1
			800001-120000	2
			1200001-160000	3
			Above 1600000	4
5	Existing Commercial	15	0-200	0
			201-400	1
			401-600	4
			601-800	3
			Above 800	2
6	Water Bodies	10	0-500	0
			501-1000	1
			1001-1500	2
			1501-2000	3
			Above 2000	4
7	Existing Built-up	20	0 -100	0
			101 - 200	3
			201 - 300	4
			301 - 400	2
			Above 400	1
8	Slope	5	0 º - 2 º	4

Landi Kotal Commercial Suitability Map



Legend

- Primary Road
- Secondary Road
- Urban Boundary

Land Uses	Area (Sq. Km)	Percentage
Least Suitable	6.87	65.96%
Moderate Suitable	2.18	20.88%
High Suitable	1.37	13.16%
Total	**10.4**	**100%**

Project:
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Planning and Development Department
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Consultant:
THE URBAN UNIT
F & D Department, Punjab
HP Consultant Planners (SMC-Pvt.) Ltd.
Town Planners Engineers and Architects

Coordinate System: GCS_WGS_1984
At A3 Paper Size
0 0.275 0.55 1.1 Kilometers

Map 9: Landi Kotal Urban Center: Suitability Map of Commercial

Source: The Urban Unit

2.2. Industry

Zones close to existing built-up were given lower values for the suitability of industrial areas, while the zones farther away were given greater values. Lower values mean less considerable areas whereas higher values mean more considerable.

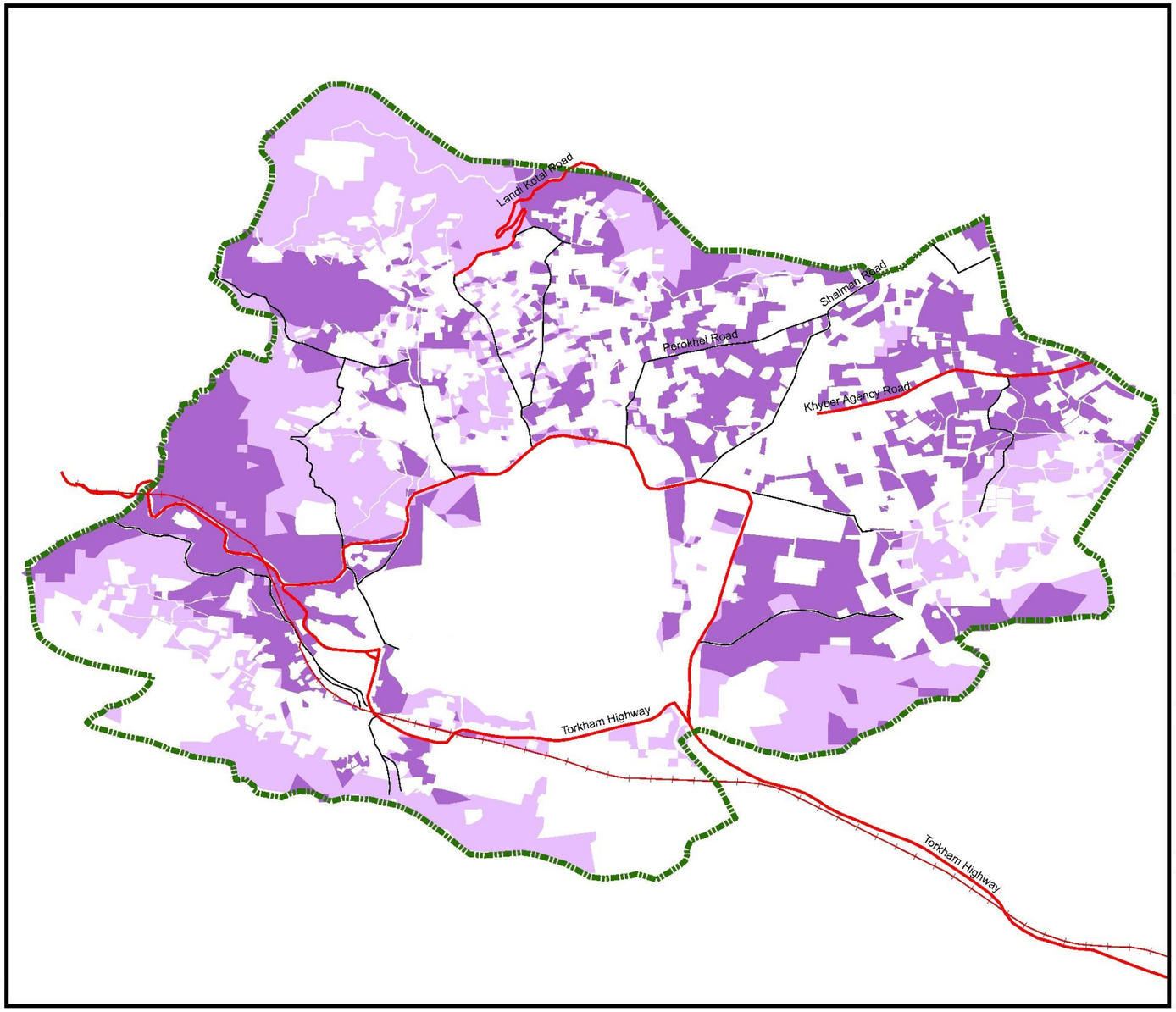
Likewise, the layer of existing built-up area was reclassified; the area near the existing built-up area was given a lower value whereas the area away from the built-up area was given a higher value. Table 2-2 outlines the important parameters for proposing a new site for industries. The values assigned to different layers are based on the requirement of each land use.

Table 2-2: Multi Criteria Analysis Industrial Development

S. No	Parameters/Layers	Influence (Total = 100)	Classes (In meters/degree/PKR)	Weights 0-1 = Least 2 = Moderate 3-4 = Highly
1	Secondary Road	15	17-200	4
			2001-400	3
			4001-600	2
			6001-800	1
			Above 800	0
2	Land Cover	15	Vacant land	1
			Barren land	2
3	Land Value Rs. Per Marla	10	30000-400000	4
			400,001-800000	3
			800001-120000	2
			1200001-160000	1
			Above 1600000	0
4	Existing Industry	10	0-500	4
			501-1000	3
			1001-1500	2
			1501-2000	1
			Above 2000	0
5	Water Bodies	10	0-500	2
			501-1000	4
			1001-1500	3
			1501-2000	1
			Above 2000	0
6	Existing Built-up	20	0 -100	0
			101 - 200	1
			201 - 300	2

S. No	Parameters/Layers	Influence (Total = 100)	Classes (In meters/degree/PKR)	Weights 0-1 = Least 2 = Moderate 3-4 = Highly
			301 - 400	3
			Above 400	4
7	Slope	10	0 º - 2 º	3
			2.1 º - 4 º	4
			4.1 º - 6 º	2
			6.1 º - 8 º	1
			Above 8º	0
8	Water Table	10	130-150 ft	4
			151-200 ft	3
			201-250 ft	2
			251-300 ft	1
			Above 300 ft	0

Landi Kotal Industrial Suitability Map



Legend

- Primary Road
- Secondary Road
- Urban Boundary

Land Uses	Area (Sq. Km)	Percentage
Least Suitable	5.65	54.23%
Moderate Suitable	2.31	22.13%
High Suitable	2.46	23.64%
Total	**10.4**	**100%**

Project:
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Client:
Urban Policy and Planning Unit
Planning and Development Department
Government of Khyber Pakhtunkhwa

Consultant:
THE URBAN UNIT
Urban Sector Planning & Management Services Unit (Pvt.) Ltd.
P & D Department, Punjab
HP Consultant Planners (SMC-Pvt.) Ltd.
Town Planners Engineers and Architects

Coordinate System: GCS_WGS_1984
At A3 Paper Size
0 0.275 0.55 1.1 Kilometers

Map 10: Landi Kotal Urban Center: Suitability Map of Industrial

Source: The Urban Unit

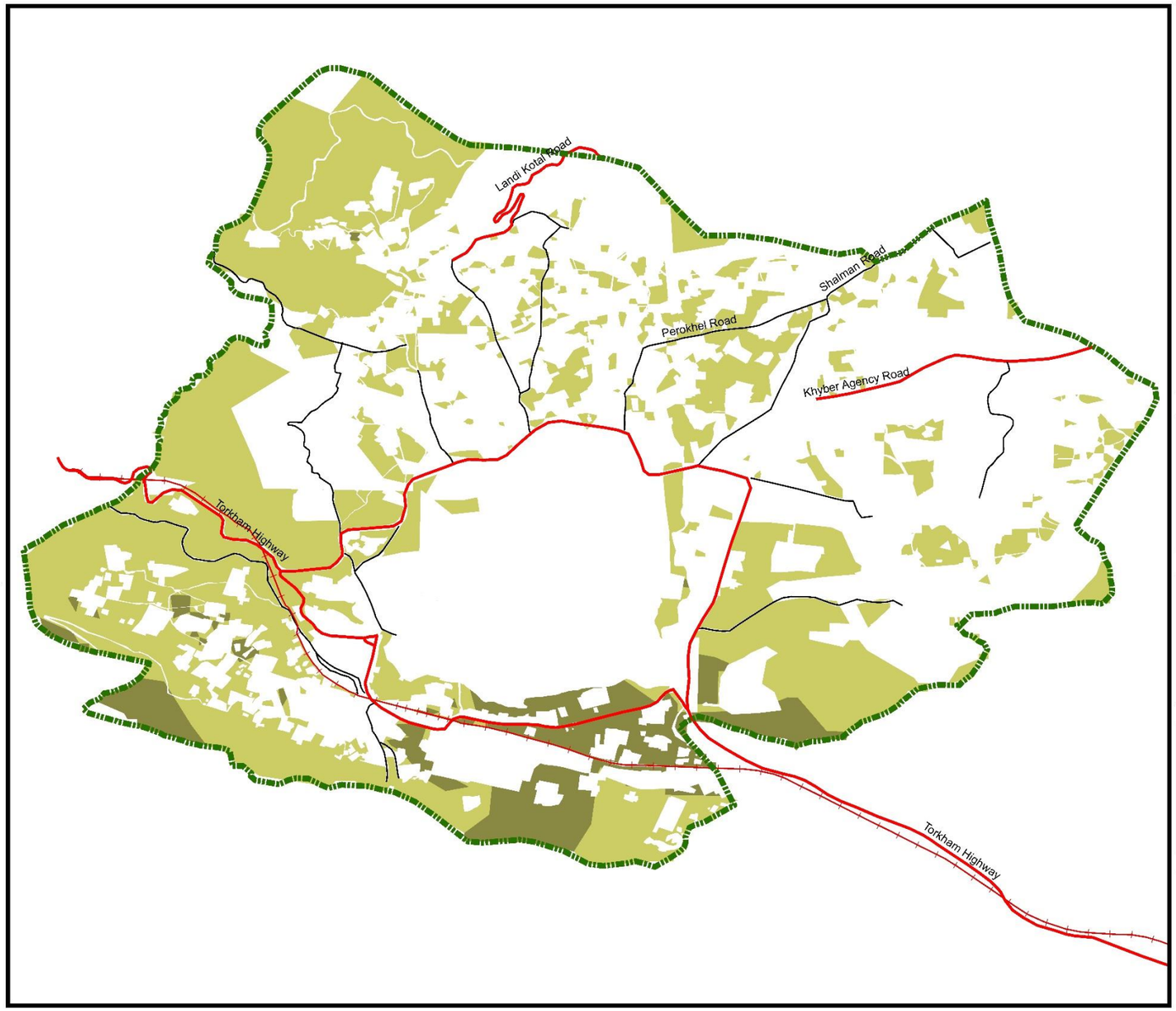
2.3. Landfill Site

For Landfill suitability, most of the influence was given to secondary roads, land cover and existing built-up area. The values and layers considered to be influential to landfills are shown in Table 2-3.

Table 2-3 Multi Criteria Analysis Landfill

S. No	Parameters/Layers	Influence (Total = 100)	Classes (In meters/ degree/ PKR)	Weights 0-1 = Least 2 = Moderate 3-4 = Highly
1	Secondary Road	20	17-200	1
			2001-400	2
			4001-600	3
			6001-800	4
			Above 800	0
2	Land Cover	20	Vacant land	1
			Barren land	2
3	Land Value Rs. Per Marla	10	30000-400000	4
			400001-800000	3
			800001-120000	2
			1200001-160000	1
			Above 1600000	0
4	Water Table	10	130-150 ft	0
			151-200 ft	1
			201-250 ft	2
			251-300 ft	3
			Above 300 ft	4
5	Existing Built-up	20	0 -500	0
			501 - 1000	1
			1001 - 1500	2
			1501 - 2000	3
			Above 2000	4
6	Slope	20	0 º - 2 º	0
			2.1 º - 4 º	1
			4.1 º - 6 º	4
			6.1 º - 8 º	3
			Above 8º	0

Landi Kotal Landfill Suitability Map



Legend

- Primary Road
- Secondary Road
- Urban Boundary

Land Uses	Area (Sq. Km)	Percentage
Least Suitable	6.70	64.26%
Moderate Suitable	3.23	30.98%
High Suitable	0.50	4.76%
Total	**10.4**	**100%**

Project:
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Town Planners Engineers and Architects

Coordinate System: GCS_WGS_1984
At A3 Paper Size
0 0.275 0.55 1.1 Kilometers

Map 11: Landi Kotal Urban Center: Suitability Map of Landfill

Source: The Urban Unit

2.4. Residential

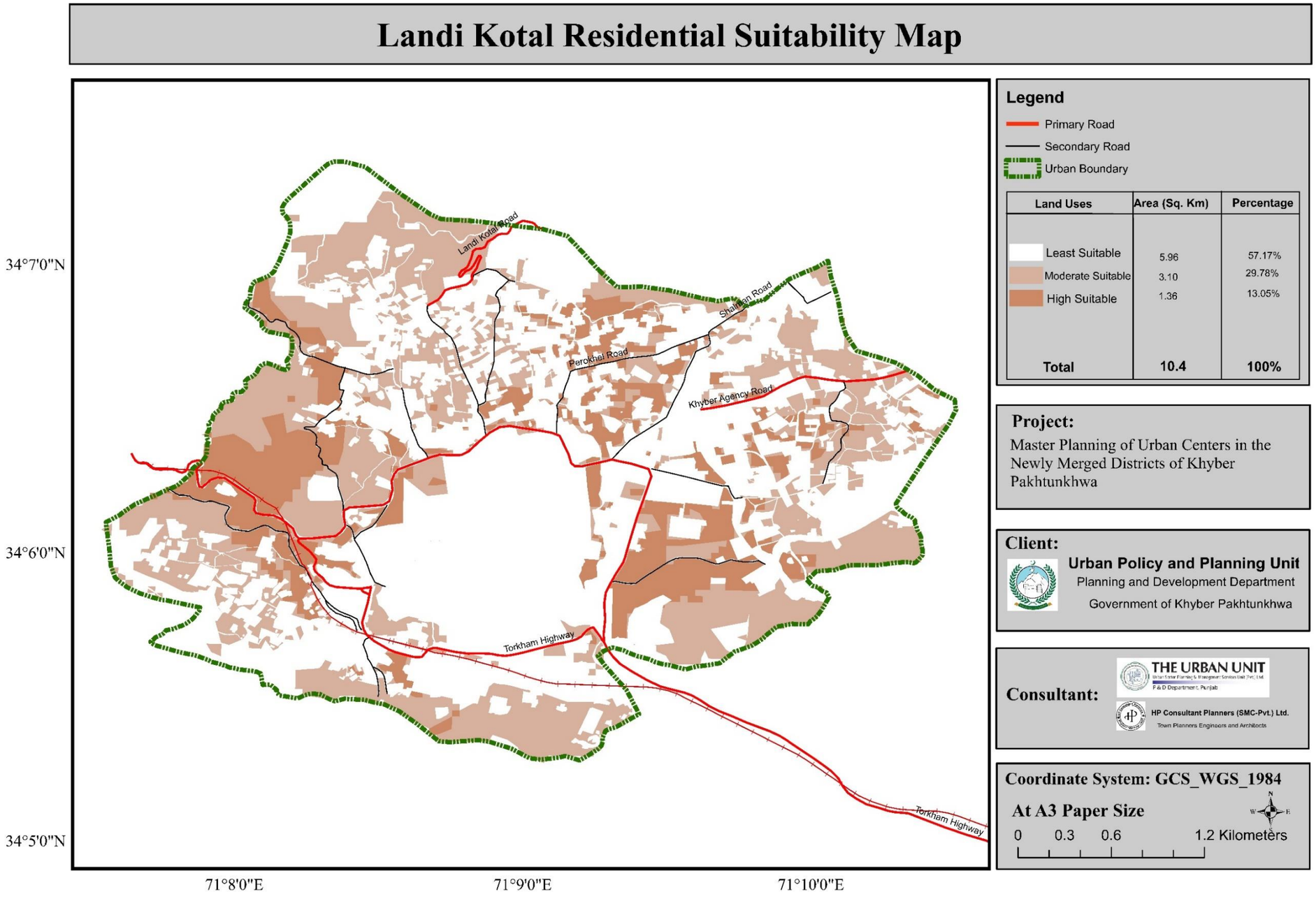
Built up area was extracted from a detailed land use map of the area. An effort was made to ensure that the projected residential area wouldn't be too far from the current built-up area. For this purpose, the distance from built up area was calculated and zones near the existing built-up area were given higher values.

A selection of proper site for residential purpose is needed so as to secure the agriculture land and efforts should be made that suitable land is located on vacant land to secure farm land. To come up with the suitability of a site for residential purposes, agriculture was assigned less value and open space was given the highest value.

Table 2-4: Multi Criteria Analysis Residential Development

S. No	Parameters/Layers	Influence (Total = 100)	Classes (In meters/degree/PKR)	Weights 0-1 = Least 2 = Moderate 3-4 = Highly
1	Primary road	5	17-250	4
			251-500	3
			501-750	2
			751-1000	1
			Above 1000	0
2	Secondary road	10	17-200	4
			201-400	3
			401-600	2
			601-800	1
			Above 800	0
3	Land cover	20	Vacant land	2
			Barren land	1
4	Land Value Rs. Per Marla	15	30000-400000	4
			400,001-800000	3
			800001-120000	2
			1200001-160000	1
			Above 1600000	0
5	Slope	10	0 º - 2 º	4
			2.1 º - 4 º	3
			4.1 º - 6 º	2
			6.1 º - 8 º	1
			Above 8º	0
6	Existing Commercial	10	0-150	0
			151-300	1
			301-450	4
			451-600	3
			Above 600	2

S. No	Parameters/Layers	Influence (Total = 100)	Classes (In meters/degree/PKR)	Weights 0-1 = Least 2 = Moderate 3-4 = Highly
7	Existing Industry	10	0-600	0
			601-1200	1
			1201-1800	2
			1801-2400	4
			Above 2400	3
8	Water Table	10	130-150 ft	4
			151-200 ft	3
			201-250 ft	2
			251-300 ft	1
			Above 300 ft	0
9	Water Bodies	10	0-400	0
			601-800	1
			801-1200	2
			1201-1600	3
			Above 1600	4



Map 12: Landi Kotal Urban Center: Suitability Map of Residential

Source: The Urban Unit

Chapter 3: Approaches and Standards for Land Use Planning

3.1. Land Suitability

Land suitability is an important aspect of land use planning and helps identify the most viable locations for future development and expansion of land uses, with respect to topography, environment, demography, infrastructure, and existing urban dynamics.

Land suitability should however not be seen as static and constant throughout the planning horizon. Instead, a well-developed Master Plan focuses on improving the land suitability of an area through provision of infrastructure, holistic land use planning, and development of planning guidelines and regulations. The existing land suitability analysis is therefore used as a starting point for improving the development conditions of Landi Kotal.

In this regard, a comprehensive strategy has been developed to improve the water supply, sanitation, sewerage, and solid waste management infrastructure (see Draft Master Plan report Section 14) in order to facilitate future urban development in the underserved areas of Landi Kotal. Furthermore, a holistic land use plan has been developed based on the future needs of the area along with planning standards based on the National Reference Manual.

This master plan therefore focuses on providing a mix of compatible land uses based on these planning concepts and standards. Applications include; separating proposed industrial and residential land uses to prevent hazards and negative health outcomes, maintaining proximity of proposed commercial and residential uses to ensure that the population is well served with commercial outlets and job opportunities, and proposing low-income housing near industrial areas to reduce travel time and costs to places of work.

3.2. Land Allocation Standards – National Reference Manual

The subject area is comprised of various land use zones of which substantial uses include residential, commercial and industries. The proposed land uses include residential, commercial, industrial, educational and health facilities, an economic corridor, parking lots, and a logistics hub.

The National Reference Manual provides guidelines on the ideal mix of land uses in terms of recommended percentages of land allocation for each land use based on population. The projected population 2040 has been used as a basis for adopting the

appropriate NRM guidelines on land use allocation. The NRM recommendations are summarized in Table 3-1.

Table 3-1: NRM Guidelines

City/Town Population Size Class	Residential %	Industrial %	Commercial %	Institutional %	Arterial Circulation/ Terminals %	Recreational Open Spaces %	Graveyards %	Vacant %
All Size Classes	24-50	2-20	0.5-5	2-21	2-29	0.5-7	0.5-6	3-45
500,000+	24-32	2-15	1-2	3-8	13-20	2-5	0.5-3.5	9-45
100,000-499,000	26-48	3-8	0.5-2	2-10	12-29	1-7	0.5-4	3-17
50,000-99,000	27-43	2-20	1-5	3-11	3-27	1-6	0.5-6	8-26
25,000-49,000	26-50	3-11	0.5-3	2-21	2-18	0.5-2	1-4	7-31

Source: National Reference Manual, 1985

3.3. Proposed Urban Form of Landi Kotal

Using Homer Hoyt's sectoral Land Use model, the following five type of land use zones have been proposed for Landi Kotal:

- Commercial Zone
- Industry zone
- Infill Development zone
- New Town (Residential Zone)
- Mixed Use Zone/ Economic Corridor

Details of each proposed land use zone to be implemented in the master plan of Landi Kotal are provided in the following sections.

3.3.1. Zone "A" Commercial Zone

This zone covers the proposed commercial zones in Landi Kotal urban center. The commercial zones are proposed alongside Hamza Baba Park and near to mining area and the CBD is declared within the existing commercial area. Economic development

often follows major transportation arteries because these areas offer high visibility and accessibility, making them attractive to businesses and consumers. Therefore, proximity to primary roads, secondary roads, existing commercial land, industrial areas, residential areas, transit points (bus stands, railway station, shopping malls etc.) and existing municipal infrastructure services have therefore been the selected criteria for determining commercial development.

3.3.2. Zone “B” Light industry zone

As per international best practices and the National Reference Manual for Infrastructure Standards, two industrial zones have been proposed alongside the mining area and along National Highway 5. These locations are suitable due to their relatively flat terrain and accessibility by main roads. Moreover, they are segregated from the existing and proposed residential areas with an appropriate distance in line with the standards.

3.3.3. Zone “C” Infill Housing

Infill housing refers to the development of new residential units on vacant or underutilized land within an already built-up urban area.

According to the *KP Local Government Private Housing Schemes Management and Regulations, Rules 2021*, up to 50 Kanals is the minimum area for the development or declaration of new town. Therefore, the lands spanning less than 50 Kanals between built-up areas have been considered as part of the Infill Zone.

This involves utilizing the available lands within existing neighborhoods, which include spaces between buildings or vacant lots, to create additional housing options. Infill housing helps maximize land use efficiency, reduces urban sprawl, and revitalizes established urban areas. Some advantages of infill housing for areas like Landi Kotal are:

1. People live in closer proximity to their place of work;
2. Increased dependence on walking and public transportation;
3. Increased number of affordable housing units;
4. Ability to utilize existing infrastructure like roads, transit, and parks;
5. Ability to redevelop vacant or underused properties; and
6. Creates mixed-use projects i.e. urban regeneration

The land allocation percentage for infill housing and development can vary depending on the specific goals and characteristics of the urban center, existing land use patterns, and the overall development strategy. It is however common for urban planning practices to encourage a significant portion of new housing development to occur through infill projects.

While there are no universally prescribed percentages, land allocations for infill housing are influenced by factors such as:

- **Land Availability:** The amount of vacant or underutilized land within the urban center. If there is limited available land, a higher percentage of development may be directed towards infill projects.
- **Revitalization Objectives:** Infill development is often used as a tool for urban revitalization and neighborhood renewal. In such cases, a higher land allocation percentage for infill housing may be prioritized to promote economic development and improve the quality of existing urban areas.
- **Zoning and Land Use Policies:** Zoning regulations and land use policies can influence the allocation of land for different types of development. If the zoning code allows for higher densities or mixed-use development in certain areas, it can encourage more infill housing allocation.
- **Community Priorities:** Community input and preferences can also influence the land allocation percentage for infill housing. It is important to consider the needs and aspirations of the local community when determining the allocation of land for infill development.

3.3.4. Zone “D” Residential New Towns

Infill development alone will not be sufficient to meet the housing needs of the Landi Kotal urban core during the course of the 20-year plan. Although infill housing is an option for compact development, it is suggested that the substantial unoccupied land inside the Landi Kotal urban area boundary be used for improved and planned housing schemes at various sites to accommodate all socioeconomic levels. The new housing zones are therefore being proposed along NH-5 and Landi Kotal By-pass.

3.3.5. Zone “E” Mixed Use Zone/Economic Corridor

City’s like Landi Kotal are more prone to growth along a main road than concentrically. A linear mixed use/economic corridor has therefore been proposed along the National Highway-5 to promote ribbon development in an efficient and planned manner. This results in defined sectors and partial rings of activity and land uses around this economic corridor which features a mixed zone containing public and private health and education facilities and economy generating land uses. The city's mixes of various layers and how they are kept together will enhance the existing quality of life for the people in light of its socio-cultural legacy.

With the sector land use model in mind, proposals have been made for the Landi Kotal urban area such that sector-based growth and development alongside transportation corridors is optimized. Given that the CBD is conveniently located in the city and is highly reachable, the proposed development is in accordance with the Sector Land Use model with slight variations.

Chapter 4: Scenario Development

Scenarios are possible future conditions of Landi Kotal that can be predicted using models and spatial data. It assists in proactive decision making about the many ways the future may unfold and how authorities can be responsive, resilient, and effective in the short- and long- terms.[6]

The scenario planning process in Landi Kotal begins with scanning the current reality, forming forecasts, and considering the influential internal and external factors to produce a set of plausible potential futures (i.e. scenarios). It then develops a series of initiatives, projects, and policies that may help support a preferred scenario, a component of a scenario, multiple scenarios, or all scenarios which indicate how a scenario component is likely to occur. This alerts authorities when the likelihood of a scenario becoming a reality is higher, prompting them allocate funds and moving into implementation.[7]

As land use is the foundation of all urban development, land development scenarios have been used to represent the future development in Landi Kotal urban center. This helps understand the potentials and constraints in the development of the Landi Kotal urban area for the planning period.

Three scenarios have been envisioned to provide a better look at the future proposals for Landi Kotal city. The details of each are explained in the sections below.

4.1. Scenario A: Business as usual (BAU)

The Business as Usual (BAU) scenario has been developed for the Landi Kota urban center keeping in view that “things won’t change” and grow as per convenience. This focuses on the identification of problems that exist in the Landi Kotal urban center without any planning interventions. Future projections have been made in the Background Study Report to forecast the effects of the current scenario for future years.

According to the 2017 population census, the total population of Landi Kotal Urban Area is 33,729, and the average annual growth rate is 2.19%. The future population is predicted based on the previous census reports and growth rate. The future population

[6] https://www.planning.org/knowledgebase/scenarioplanning/
[7] https://www.planning.org/knowledgebase/scenarioplanning/

is projected for the year 2040 through the geometric growth method which is approximately equal to 55,513. As the population increases, so will the demand for utilities, services, and housing. There will be lesser education and employment opportunities for the future generation. The accommodation of the future population and provision of amenities and services will pose a great challenge for development authorities.

4.1.1. Sector-Wise Problems and Future Projections

The existing problems and their impacts on each sector have been discussed in this section to foresee the future situation if no interventions are made. The BAU for each sector is given below to examine how they will unfold their respective dimensions in the future.

4.1.1.1 Residential

The Housing is an important sector as housing, besides providing shelter and raising the quality of life, is closely associated with the process of overall socio-economic development.

The weak structure of Local Government, overlapping of existing laws, land-use rules and regulations, local conflicts, and lack of disaster management has caused many social, environmental and economic issues which have directly affected the housing sector of Landi Kotal. This has resulted in housing dilapidation, shortage, and overcrowding. The quality of housing has deteriorated due to the poor economic condition of people, weak building control, and low awareness of modern construction methods.

Table 4-1: Existing Housing *Structure in Landi Kotal*

Structure type	Percentage
Katcha	41.27%
Pakka	14.13%
Semi Pakka	44.60%
Grand Total	100.00%

Source: HIS Survey, Urban Unit and HP Consultants

The existing layout of residential buildings of the Landi Kotal urban center is irregular and the primary building material is mud and brick stone. The trend of making new

buildings using concrete is replacing the traditional environmentally friendly construction materials which will create a jungle of concrete in the future.

As per the Background Study report, housing structures in Landi Kotal are not according to planning standards and the current situation of housing is highly unsatisfactory as 41.27% of the houses in the area are Katcha. If this pattern continues, there will be no development in the housing infrastructure and the katcha housing will eventually collapse following a disaster and cost the lives, economy and infrastructure of the Landi Kotal urban center.

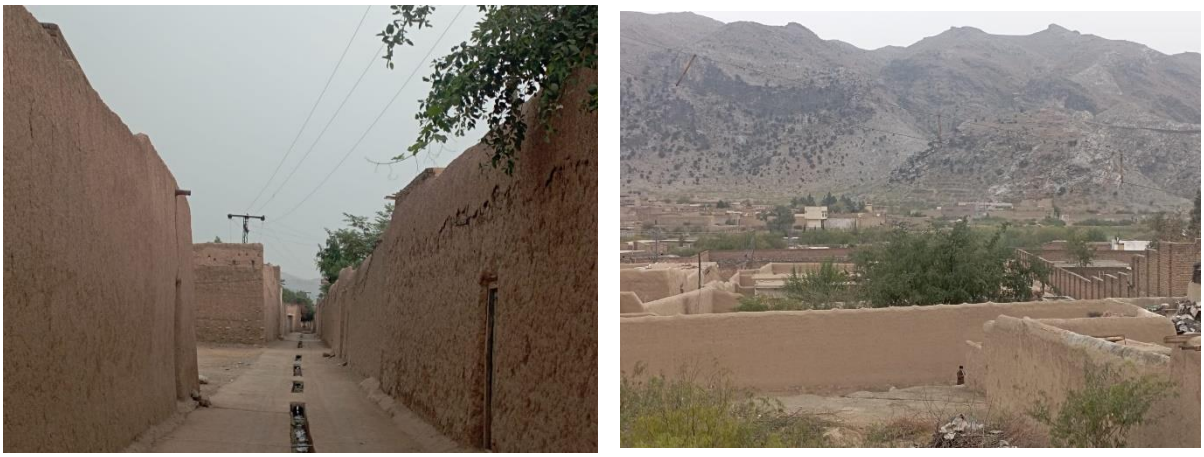


Figure 4-1: Existing Condition of Residential Buildings

Owing to the tradition of the area, specifically privacy, almost 94% of the total houses are single-story. As prices are low in rural and tribal areas, most houses are single story with a maximum height of 20-25 feet from the ground. If no interventions are made, there will be insufficient land for future housing as the density is low at the current stage. With increasing population and housing demand, will aggravate this problem and cause agricultural land to be utilized to accommodate more housing. This results in urban sprawl which ultimately degrades the environment and hinders proper land utilization.

Table 4-2: Existing Size of Housing Units

Size of housing units	Percentage distribution
Less_than_5_Marlas	1.66%
5-10 Marlas	21.05%
11-20 Marlas	26.32%
Above 20 Marlas	50.97%
Grand Total	**100.00%**

Source: HIS Survey, Urban Unit and HP Consultants

The household survey reveals that approximately 50.97% of the sample housing units are greater than 20 Marla's. 26.32% of the housing units are between 11 and 20 Marlas, 21.05 % of housing units are between 5 to 10 Marlas, and only 1.66% of the total housing units are less than 5 Marlas.

Meanwhile, 73% of the population earns less than 30,000 PKR a month. The income level is low while the land ownership and area of housing is greater than required. Accommodating less population and utilizing larger plots of land will trigger problems in the quality of housing due to low income and investment on housing. The backlog of prime developable land will cause abuse of resourceful agricultural and forest lands for housing.

The existing scenario shows that the land utilized for housing or residential purposes is insufficient for the current population of the Landi Kotal urban center, with an overall shortage of 9,668 housing units. The projection shows that the area required for 2040 is 2.09 sq.km. for residential zones with a proposed household size of 5.67 person. Details for these projections and housing demand are provided in **Section 6.1: Residential Zone**.

Based on current housing conditions, the situation may worsen by 2040 if the BAU is adopted. It will not only widen the gap between the demand and supply but also trigger associated problems such as lack of water supply causing decreased water levels of the area, lack of sanitation services causing health and hygiene issues, and overcrowding, which will affect the living standards and livability of the urban center.

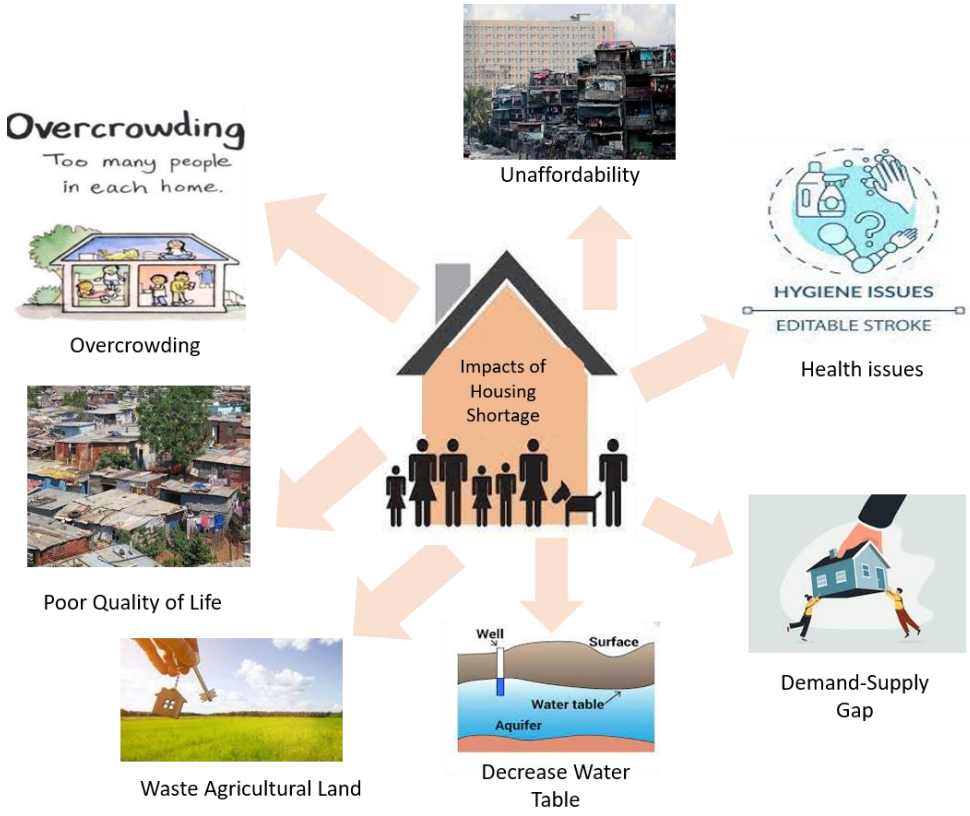


Figure 4-2: Impact of Housing Shortage

4.1.1.2 Commercial

Landi Kotal urban center has been lacking in economic development due to the illegal conversion of land, the absence of a tax collection system, the unavailability of electricity and gas supply to markets/bazaars, the non-availability of materials, and the lack of infrastructure. If no interventions have been made in the future, the area will not be stable enough to contribute to the overall national economy of the country.

Landi Kotal is close to the Afghanistan border and hub of commercial activities. The analysis of commercial land use presently (2022) shows that it occupies about 56.83 acres of land, which is around 2.18% of the total land use. The urban population of the Landi Kotal urban area in 2022 was 37,588 persons.

The projected population of Landi Kotal for the year 2040 is 55,513. According to the National Reference Manual, the commercial area must be between 1-5 percent of the total land use for such population. While the current area is 2.18 percent, there is a need for further commercial development. If the current situation continues and the required commercial area is not provided, there will be less employment for locals,

/decrease marketability, less sales and purchases of commodities, reduced capital value and ultimately low productivity of the area.

The commercial buildings are deteriorated and the natural skyline of the area is not followed due to the absence of design guidelines and standards. There are apparently no by-laws that are given or enforced by the authorities. Open sewage lines add to the unpleasant experience of the commercial areas, and there are no designated parking spaces. If no interventions are made, the economy, trade, visitor influx, and overall commercial fabric of the area would be ultimately degraded.

Moreover, the conversion of residential land uses into various types of economic activities is a new phenomenon, particularly along major roads of residential areas and arterial roads of the urban center. This conversion has proceeded with and without official consent in a haphazard manner. In the future, this will result in parking problems, reduced traffic capacity of roads, and subsequently increased congestion, energy use, air and noise pollution, and burden on utility services.

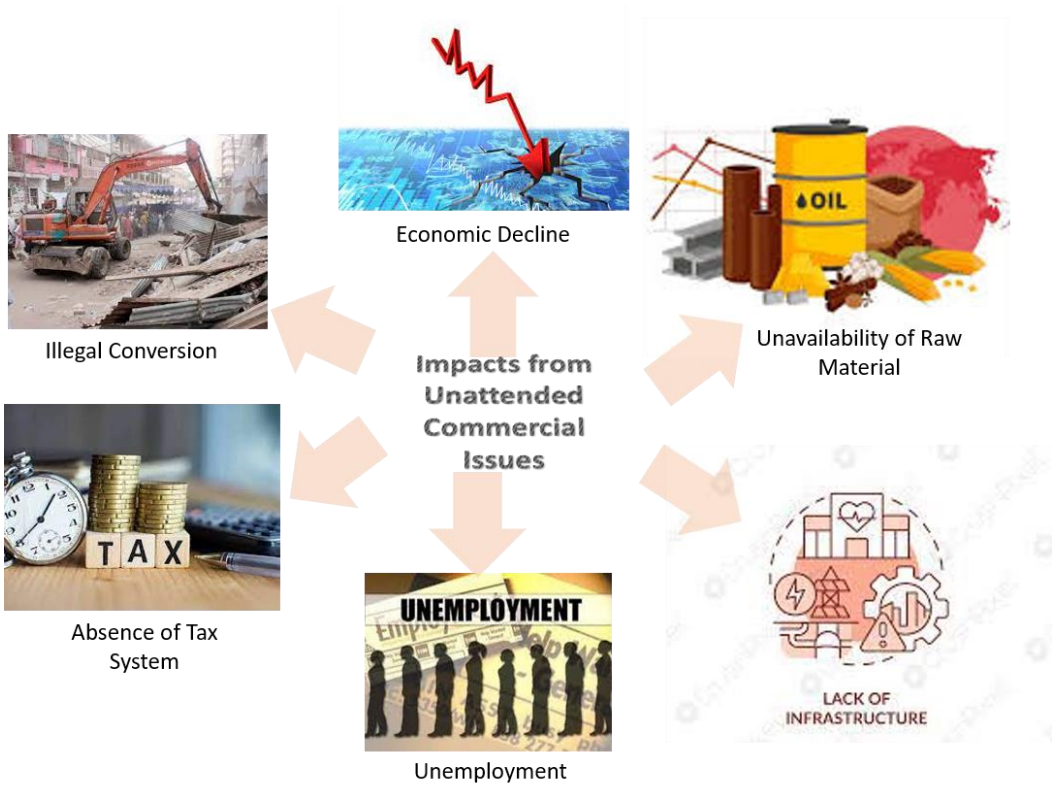


Figure 4-3: Unattended Commercial Development

4.1.1.3 Industry

Owning to its proximity to the border, the industrial products-related needs are not fully met under the Afghanistan Transit Trade. The security of the area has hampered any

industrial growth and has resulted in a small base for industrial production in the area. There is no any existing industrial development in the area.

Lack of power is a significant issue of low industrial productivity in Landi Kotal. If no interventions are made, the area will lose industrial potential (from Afghanistan), and exhibit lower levels of productivity and employment, less human capital and finances, higher costs of production and substandard products, weak infrastructure, less role of public and private sector enterprise and trade policy distortion.

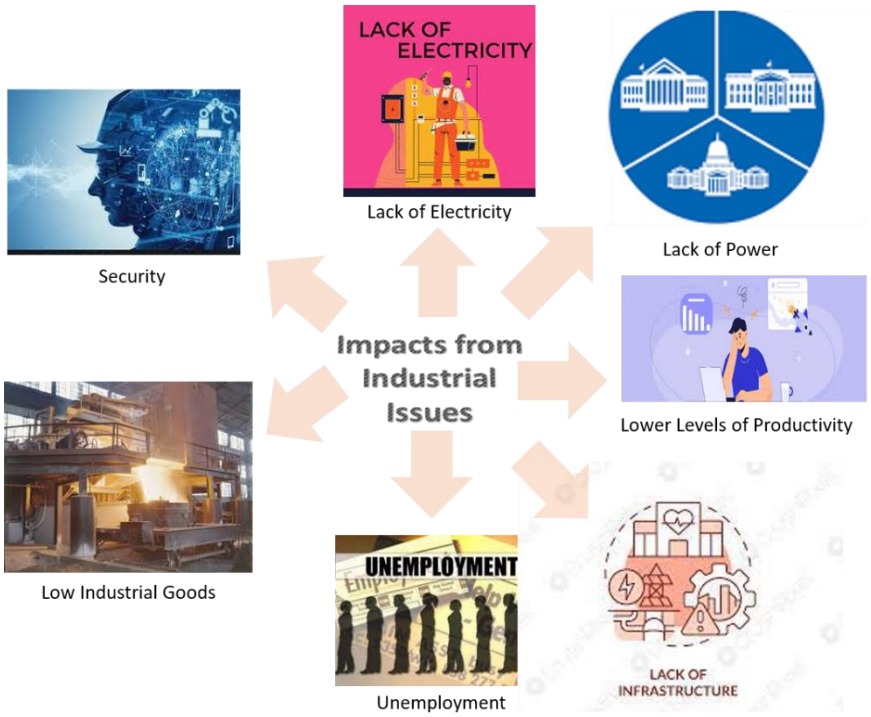


Figure 4-4: Impact of Industrial Issues

4.1.1.4 Education

Low literacy rate, high gender disparity, and substandard infrastructure are significant issues in Landi Kotal urban center. Lack of middle schools for girls and vocational and training centers will eventually affect the economy, employability and contribution to the GDP of the future generations.

The supply of educational facilities and gender inequality in Landi Kotal has an impact on a family's socioeconomic position such as uneven access to education, job segregation, absence of legal protections and religious freedom, poor medical care, and lack of political representation.

If education supply issues are not addressed by 2040, future generations of Landi Kotal will be unable to attain high-order life skills such as reflection, critical thinking, analysis, research and creativity, shortened human capital and lower employability.

Figure 4-5: Consequence of Lack of Education

4.1.1.5 Health

Accessible, equitable, and quality healthcare for all people is the apparition of the Landi Kotal government. However, Landi Kotal is challenged in the health sector with few health facilities available in the urban centers which do not fulfil the health requirements of its people. This has resulted in inaccessibility of basic health facilities, ignorance of personal hygiene, overcrowding, and improper sanitation.

Few private clinics are operating in the area. According to the Background Studies of Landi Kotal, the entire tehsil Upper Kurram has only one hospital, eleven basic health units, ten community health centers, eighteen community dispensaries, and one mother and child health center.

A few private clinics are operating in the area, whereas the total number of health facilities available is just six which is insufficient to serve the population.

By 2040, if health services will not expand and are overlooked by the authorities, health disparity will worsen. Subsequently, inadequate, inaccessible, and/or poor medical care further will exacerbate healthcare costs. The workforce will also not be robust enough to function effectively following Landi Kotal's requirements as health disparities increase.

Figure 4-6: Impact of Deprived Health Facilities

4.1.1.6 Connectivity and Accessibility

The major problems of poor infrastructure, lack of public transport, shortage of trained police staff, absence of parking spaces, limited pedestrian movement and congestion continue to affect tourism and trade in the Landi Kotal urban center.

Furthermore, the lack of paved roads, shoulders, footpaths, drains, or metaled surfaces cause difficulties for the locals affect the accessibility of basic health, education, and economic activities in Landi Kotal.

If the road network remains in the same condition, there will be a decline in the tourist influx which will adversely affect the revenue generation and economic growth of the Landi Kotal urban center. Moreover, it will also burden the transport sector by damaging vehicles, increasing fuel consumption, cost of travel, and degrade the environment of the urban center. Traffic congestion in the city is causing an increase in travel costs and delays the travel time of the people which is making it impossible for outsiders to navigate in the city, eventually affecting the tourism of the city.

Absence of public transport causes accessibility issues in the urban center, motorization, irregular development of public transport systems, increase in private vehicle ownership, which ultimately burdens the environment and creates an inefficient transportation system in the future.

Traffic laws are implemented through untrained traffic police staff who are working without proper knowledge of traffic rules and regulations. This problem will result in unregulated traffic flow and an increase in number of accidents due to violation of traffic signals.

All parking activity in the Landi Kotal Urban Center is informal. People their vehicles on streets or footpath. Formal parking spaces for vehicles will be required to accommodate the future traffic and parking demand on Landi Kotal road network.

The roads of Landi Kotal are deprived of basic traffic signage. The absence of signage complicates intersections, and puts pedestrians and vehicles at risk of collisions, during times of congestion. The low-income population will be most affected by these problems as they are more vulnerable to suffering the effects of the current transportation system.

Figure 4-7: Challenges of Immobility

4.1.1.7 Landfill Site

According to the household information survey, there is no mechanism for solid waste collection, transportation and dumping implemented by the TMA. Every neighborhood council has garbage dumps, locally called "Derans," where solid waste is disposed-off. The TMA does not serve the entire area, which is a major service delivery problem in the urban center. Solid waste is left unattended in an open area and often ends up in open drains and in sewers which cause choking and overflowing of drains during Monsoon season.

An inefficient municipal solid waste management system creates serious negative environmental impacts like infectious diseases, land and water pollution, obstruction of drains and loss of biodiversity.

According to the Background Study report the waste generation of the urban center in the current scenario is 15 tons per day and 5,481 tons per year. The projections for 2040 show that it will increase to 8,094 tons per year. Under the BAU scenario, the Landi Kotal urban center will be filled with waste, adversely affect the environment, and eventually make it an endangered city.

Figure 4-8: Challenges of Solid Waste

4.2. Scenario B: Sectoral Planning

Focused on the sectoral development in order to prevent urban expansion and mushroom growth in the urban core of Landi Kotal. Different zoning and planning technique have been used such as infill housing, new towns, commercial, industrial to meet the area's long-term demands. This will contribute to the sustainability of Landi Kotal's economic growth and prosperity. The below maps show the detailed sector wise scenario.

4.2.1. Residential

A compact development approach has been employed to better utilize the available land area for providing housing in Landi Kotal. The existing residential area is 2.29 sq.km and includes a total of 2,744 existing housing units.

The NRM suggests a housing supply standard of between 27%-43% of a subject area with population between 50,000 and 99,000. The minimum and maximum residential areas are therefore 2.82 sq.km and 4.48 sq.km respectively based on a total study area of sq. km. The below table shows the existing housing statistics in Landi Kotal.

Table 4-3: Existing Housing Characteristics

Existing area (sq. km.)	2.29
Existing area (in %)	21.96%
Existing number of houses	2,744
Recommended NRM standard	27% to 43%
Recommended residential area – min (sq. km.)	2.82
Recommended residential area – max (sq. km.)	4.48
Required (Recommended (min) – Existing Land Use) sq. km.	0.53
Required (Recommended (max) – Existing Land Use) sq. km.	2.19

For Landi Kotal, both new housing and infill are recommended. Infill development is emphasized as it helps delineate the limits of growth for urban areas and protects undeveloped land at the periphery of the city. Locals are benefited from being nearer to social services and places of work. It also utilizes the existing infrastructure and facilities.

A total of 9810 dwelling units are required for Landi Kotal for the planning horizon. Detailed calculations of the housing requirements are provided in Section 6.1. The figure below illustrates the zones where housing may be provided under this scenario.

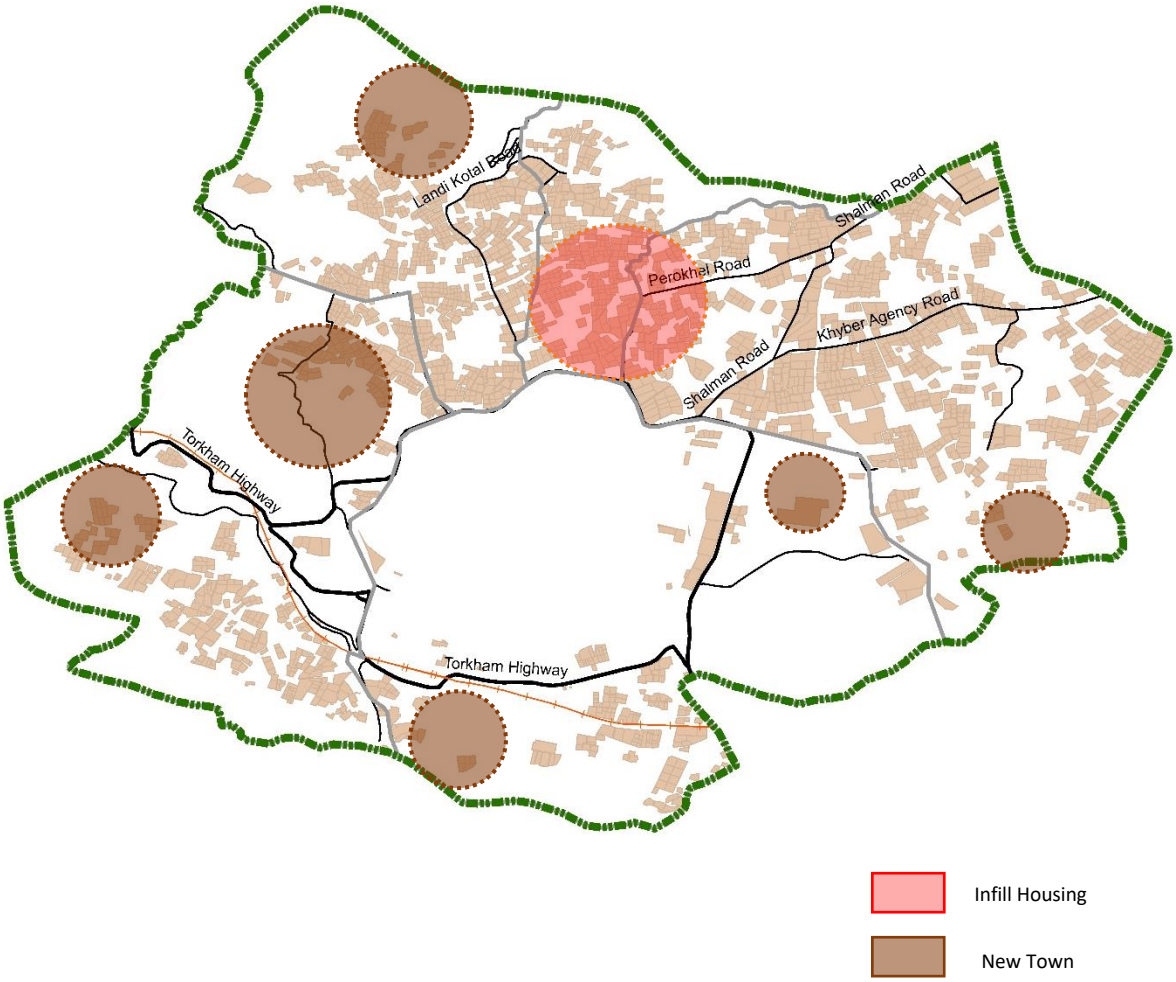


Figure 4-9: Proposed Residential Zone

Table 4-4: Key Features and Rationale for Scenario B: Residential

Key Features	Rationale
Infill housing in the strips close to the existing main road to fill the vacant parcels within existing residential area	Future housing development within existing residential area is highly feasible due to urban agglomeration dynamics, and will efficiently utilize existing space and promote denser urban form

New housing to be proposed on largely vacant land and along the main road.	This will cater the need for new housing units and helps to overcome the housing shortage

4.2.2. Commercial

The commercial zones are proposed based on the growing population and the requirements for commercial areas. This allows businesses to identify new opportunities, enter new markets, and expand their products or services. Landi Kotal is important because it is close to Afghanistan Border. The existing commercial area is 0.23 sq.km.

The NRM suggests the commercial standard between 1%-5% of a subject area with population between 50,000 and 99,000. The minimum and maximum commercial areas are therefore 0.10 sq.km and 0.52 sq.km respectively. The below table shows the existing commercial statistics in Landi Kotal.

Table 4-5: Existing Commercial Characteristics

Existing area (sq. km.)	0.23
Existing area (in %)	**2.18%**
Recommended NRM standard	1%-5%
Recommended commercial area – min (sq. km.)	**0.10**
Recommended commercial area – max (sq. km.)	**0.52**
Required Area [Recommended (min) – Existing Land Use]	**-0.13**
Required [Recommended (max) – Existing Land Use]	**0.29**

Appropriate parking, loading and unloading facilities and upgraded infrastructure needs to be provided to support the commercial areas and mixed-use activities. The area parallel to N-5 Road is suggested as an economic corridor to generate more commercial activities and to make this area economically sustainable. Furthermore, commercial areas are proposed near industrial areas.

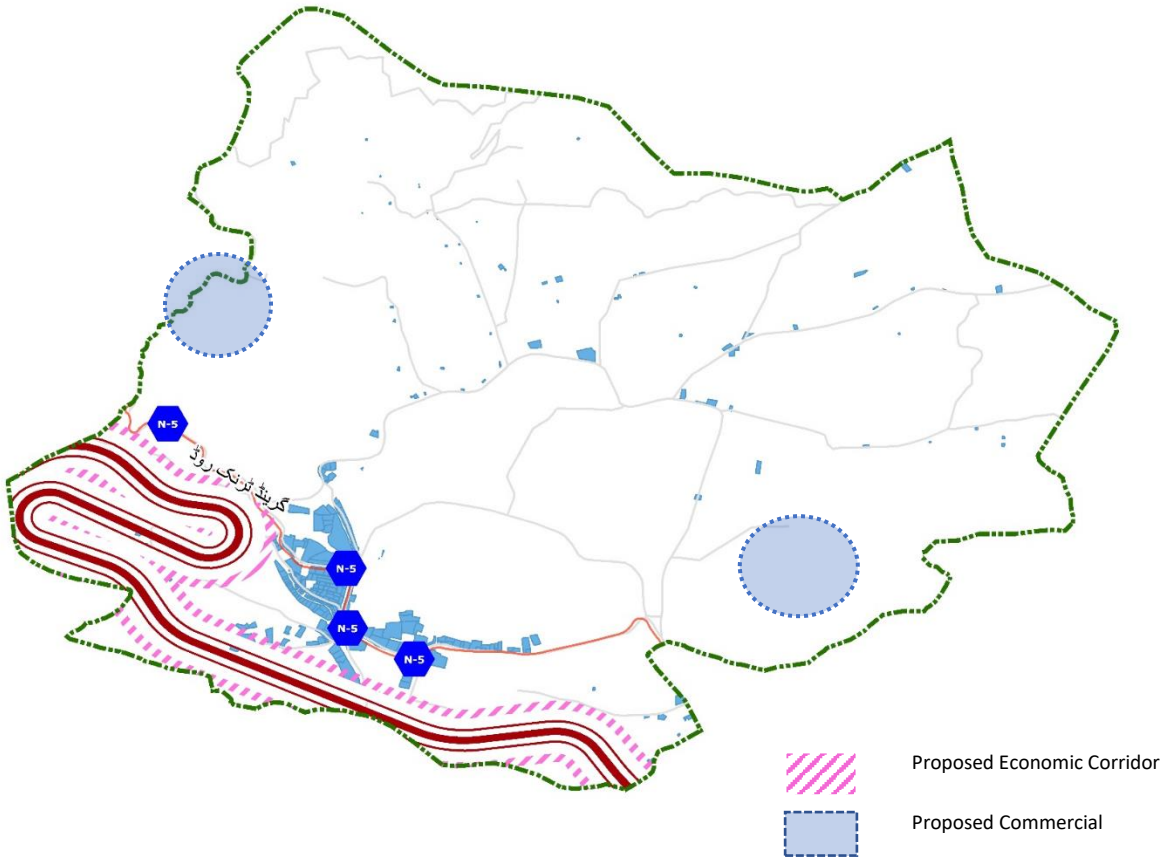


Figure 4-10: Proposed Commercial Zone

Table 4-6: Key Features and Rationale for Scenario B: Commercial

Key Features	Rationale
Area Parallel to Main Torkham Highway road to be a main economic corridor. Commercial centers to be proposed alongside the infill and new housing	They will provide connection between economic nodes or hubs, usually cantered on urban landscapes, in which large amount of economic resources and actors are concentrated. Also, link the supply and demand sides of markets. These high-visibility locations offer opportunities for infill development for local retail, housing, and social and cultural destinations.

4.2.3. Industry

Industrial zones are proposed to capitalize on Landi Kotal natural resources and subsequently strengthen the local economy in terms of GDP. Landi Kotal's proximity to the Afghan border is also an influential factor with regards to import and export activity. The existing industrial area of Landi Kotal is 0.0 sq.km.

For an area with a population between 50,000 and 99,000, The NRM suggests the commercial standard between 2%-20% utilization for industrial purposes. The range of industrial area to be provided is therefore between 0.21 sq.km and 2.09 sq.km.

Table 4-7: Existing Industrial Characteristics

Existing area (sq. km.)	0
Existing area (in %)	0
Recommended NRM standard	2%-20%
Recommended industrial area – min (sq. km.)	0.21
Recommended industrial area – max (sq. km.)	2.09
Required (Recommended (min) – Existing Land Use) sq. km.	0.21
Required (Recommended (max) – Existing Land Use) sq. km.	2.09

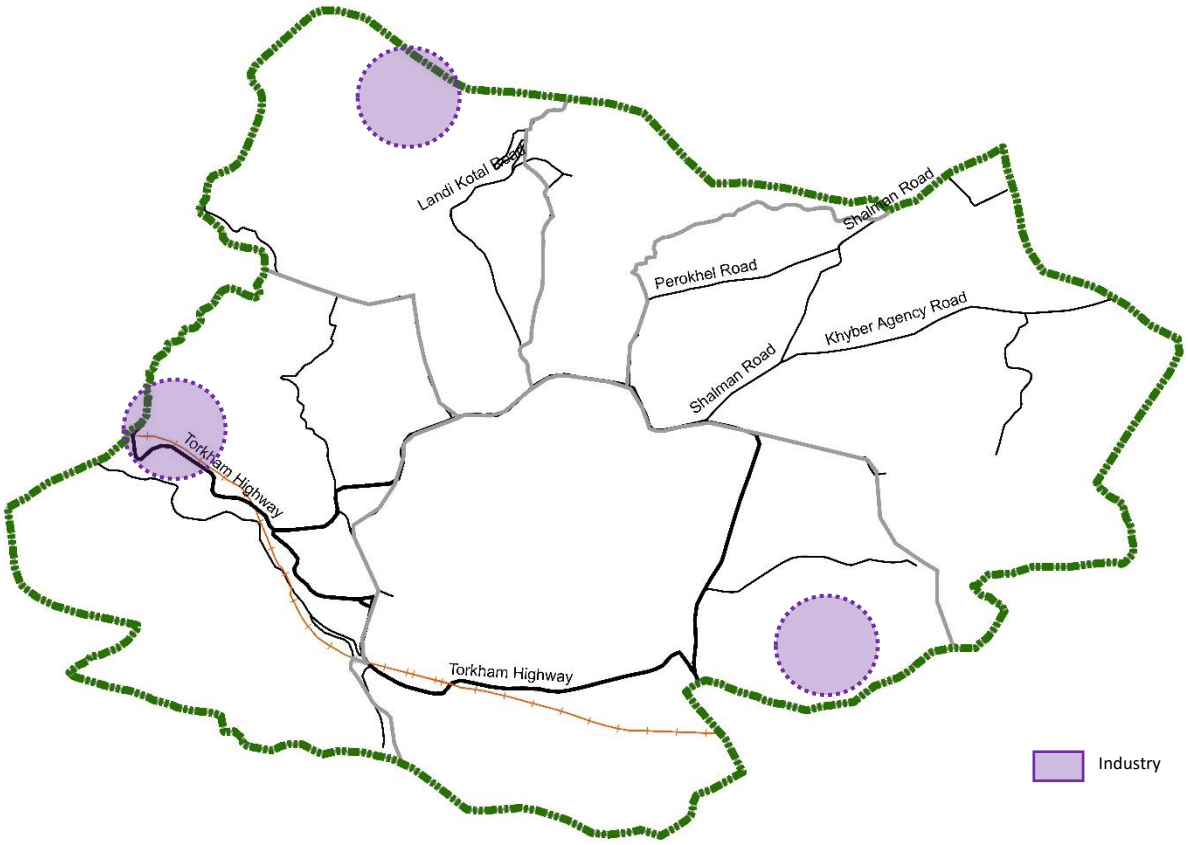


Figure 4-11: Proposed Industrial Zone

The detailed rationale of each scenario with justification is elaborated in the below table:

Table 4-8: Key Features and Rationale for Scenario B: Industry

Key Features	Rationale
Industry is proposed on the outer edges with a buffer alongside the main road Housing is proposed alongside of the industrial area	The productivity of an area will increase by industrial development. Alongside to this with an appropriate buffer, housing is provided which also helps to aid to provide shelter to labour.

4.3. Scenario 3: Multi Nuclei Model

This option focuses on compact development to control urban sprawl in Landi Kotal urban center and explore alternative utilizations of land for their effects on adjacent

and complimentary land uses. Compact development not only preserves the environment, but also generates synergies across urban systems which provide more equitable growth. This results in smaller areas of impact, makes more efficient use of utilities and infrastructure such as roads, reduces consumption of land, and can result in significant energy savings.

4.3.1. Residential

Residential zones are proposed based on the present and future demand of Landi Kotal's Urban Center. There are 2,744 dwelling units spread throughout 2.29 square kilometers.

As per NRM standard, the minimum and maximum area requirements are 2.82 sq. km and 4.48 sq. km respectively. This translates to a housing requirement of 9,810 units by 2040.

Two forms of housing are suggested to fulfil these requirements: new development and infill development. In order to boost compactness and density, infill housing is suggested within the vacant lots of the current built-up area. In the city, there is 2.27 sq.km of vacant or barren land available out of 10.43 sq.km. The total proposed area for residential development is 2.09 sq.km out of which 0.91 Sq.km is infill. 1.18 sq. km

of land is allocated for new housing development. The proposed residential zones under Scenario C are depicted in the figure below.

Figure 4-12: Proposed Residential Zone

Table 4-9: Key Features and Rationale for Scenario C: Residential

Key Features	Rationale
Infill housing in the center of city, near proposed industrial area and along the main roads in Landi Kotal	Future housing development within existing residential area is highly feasible as it will efficiently utilize existing space and discourage the speculation

New housing to be proposed near main roads and along proposed industrial area	This will cater the need for new housing units and helps to overcome the housing shortage and commute problem will be resolved for the low-income people.

4.3.2. Commercial

In line with the multi-nuclei approach, the commercial zones have been proposed to distribute the commercial activity and make it more accessible to its adjacent land uses. This is preferable to concentrating the commercial uses into a singular large nucleus which has negative effects such as congestion. In this scenario, the N-5 Road is proposed as a commercial corridor in order to constrain future haphazard and/or illegal commercial developments in its vicinity.

There are currently 0.23 sq.km of commercial spaces. By 2040, 0.01sq.km of land is proposed for commercial land use to fulfil the needs of locals. 0.37 sq.km is proposed for the mixed land use to enhance the livability and walkability of urban areas, by providing a mix of housing, employment, services, and amenities within a short distance.

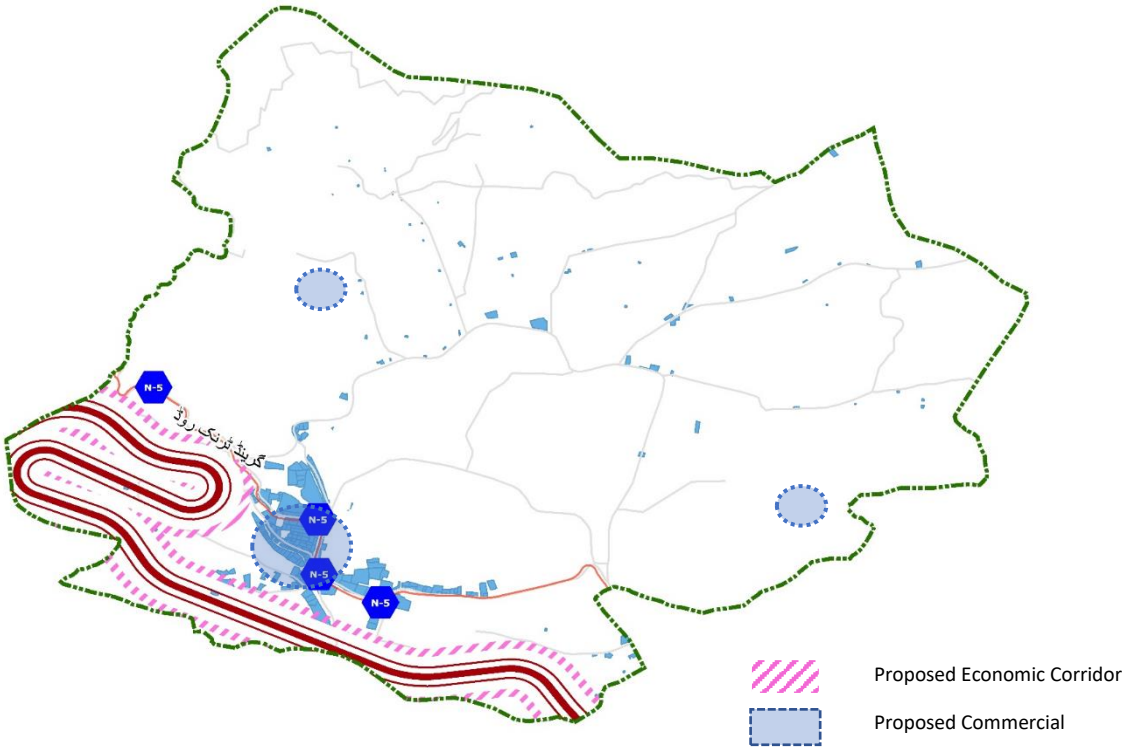


Figure 4-13: Proposed Commercial Zone

Table 4-10: Key Features and Rationale for Scenario C: Commercial

Key Features	Rationale
New commercial areas to be proposed near the proposed residential zones and industrial area	Commercial area near industrial area will give multiple benefits to residents and area in terms of economic development. Industrial goods and services are well distributed across area and it will increase overall profits by creating new revenue streams. It improves internal operations by adding services to products and enhances overall customer relationships.

4.3.3. Industry

Industrial area to be proposed keeping in view the existing and future needs of the study area. There is no existing industrial area in the Landi Kotal and the NRM recommended land allocation for industrial areas is between 2%–20%, the required industrial area is between 0.21 and 2.09 sq.km. A total of 0.30 sq.km area has therefore been proposed to fulfill the industrial demand of the area.

The industrial areas are proposed near the mining area along Road and along the NH-5 Road on east side. Both locations are feasible for daily commute and providing access to the Afghan border.

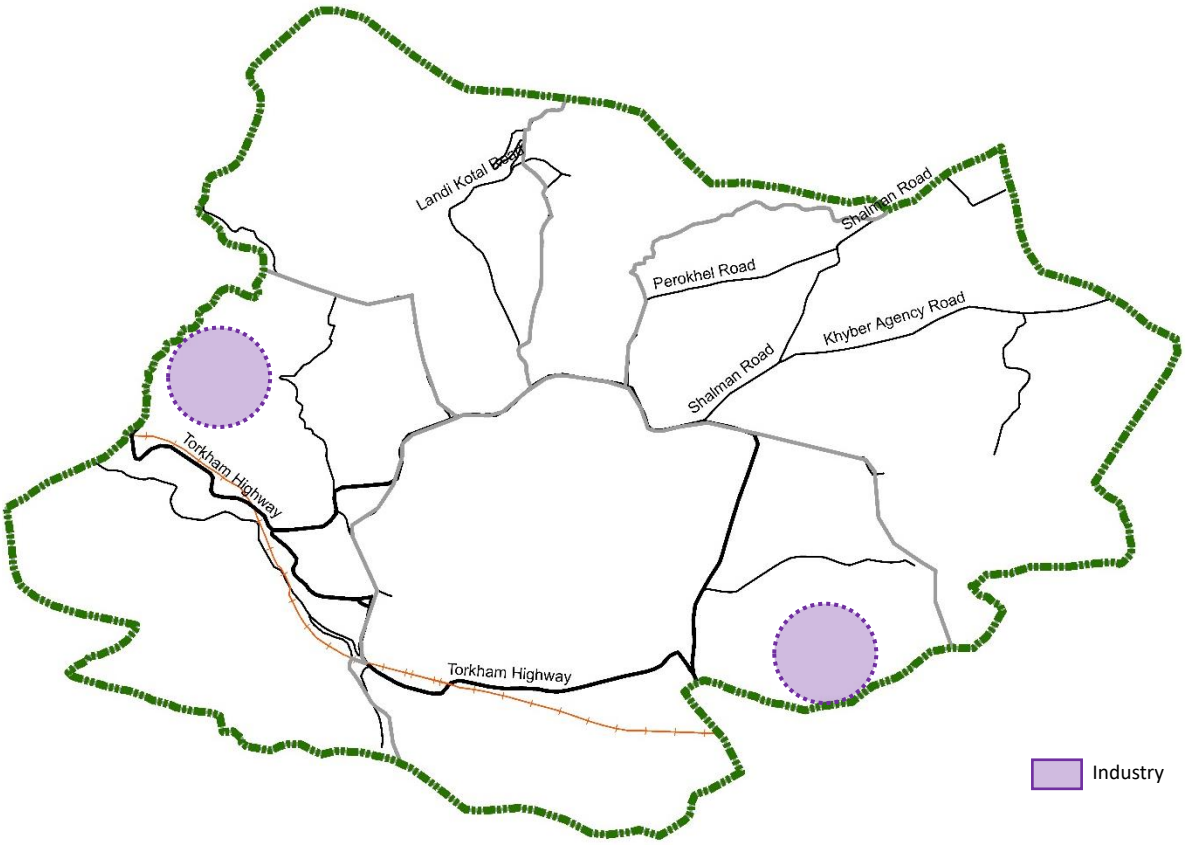


Figure 4-14: Proposed Industrial Zone

Table 4-11: Key Features and Rationale for Scenario C: Industry

Key Features	Rationale
Industrial area to be proposed on the outer edges of the city and alongside of the mining area.	The productivity of an area will increase by industrial development. Alongside to this with an appropriate buffer, housing is provided which also helps to aid to provide shelter to labour.

Both scenarios B and C have their own impacts on the study area. However, Scenario C is preferable due to its focus on compact development, and efficient utilization of land resources. Compact development is often supplemented with mixed-use development to incorporate a variety of functions (housing, offices, retail, etc.). As a result, it reduces the need for driving and promotes walkability. The detailed explanation of this scenario is explained in the Chapter 5.

Chapter 5: Proposed Strategies of Scenario Development

The progressive features that are shared by the different scenarios are considered and undesirable facts have been avoided.

Economically Viable and Regionally Sustainable Landi Kotal

In this scenario, Landi Kotal urban center adopts a comprehensive and strategic approach to its development, with a focus on ensuring the long-term viability of its economic, social, and security systems.

To achieve this, investments are prioritized in infrastructure, such as transportation networks, energy systems, and connectivity, to create an environment that is conducive to business growth and innovation. It also focuses on attracting and retaining businesses and skilled workers through policies that support entrepreneurship, innovation, and development.

This scenario prioritizes sustainable and inclusive economic growth, with a focus on reducing inequality and promoting equity. This could involve investments in social infrastructure, such as affordable housing, education, healthcare, and cultural amenities, to improve the quality of life for all residents.

In addition to economic development, Landi Kotal prioritizes trade for economic prosperity. This involves raising job opportunities and living standards for people by providing affordable goods and services, investments in green infrastructure, such as renewable energy systems, green spaces, and sustainable transportation, as well as policies and programs to encourage sustainable behavior among residents and businesses.

Overall, the goal is to create a safe, resilient, livable, and sustainable urban environment that supports economic growth and prosperity for all residents, while safeguarding the planet for future generations.

5.1. Strategies

The strategies which are adopted in the scenario development of the Landi Kotal urban center comprise compact development, eco-tourism, environmental conversation,

economic development, sustainable infrastructure and transportation, and institutionalization.

Compact Development aims to create more livable, sustainable, and vibrant urban communities that support economic development, social equity, and environmental sustainability. This strategy targets the issues of large-scale horizontal development, urban sprawl, overutilization of land, single land use, and lack of interlinked road network arising in housing, commercial, land management and transportation sectors.

Ecotourism aims to achieve a balance between economic growth and the conservation of natural resources by promoting responsible and sustainable tourism practices. This strategy will sort out the issues of environmental degradation, lack of tourism infrastructure, conservation practices, awareness, local economy, and limited tourist facilitation in the tourism sector.

Environmental conservation aims to protect and preserve the natural environment and its resources for the benefit of present and future generations This helps resolve the issues of endangered biodiversity, climate change, depletion of natural resources, deforestation, absence of environmental management plans and inadequate environmental monitoring and assessment, lack of greening strategy, fragile environmental state, deteriorating quality of air, water and land pollution, and lack of sustainable practices in environment sector of Landi Kotal urban center.

Economic Development aims to create sustainable and long-term economic growth and improvement in the standard of living in Landi Kotal urban center. It mainly concerns the issues of poverty, limited productivity, low capacity of adaptation to market demand, lack of taxation rules and regulations, unemployment, regional economic disparities, and poor infrastructure in the sectors of housing, tourism, trade and commerce, transportation, taxation, revenue, quality of life and industry.

Sustainable Infrastructure and Transportation aim to develop infrastructure and transportation systems that minimize negative impacts on the environment and promote sustainable economic growth. It aims to resolve the issues of environmental degradation, climate change, public health, higher consumer costs, social equity, accessibility and mobility, lack of road infrastructure, education and awareness, delipidated infrastructure, and inventory issues in the sectors of transportation,

economy, housing, environment, water supply, sanitation, solid waste management, tourism, urban design and quality of life.

Institutionalization aims to establish a set of policies, procedures, and practices that ensure the long-term stability and sustainability of Landi Kotal urban center. This strategy will target the problems of institutional capacity, governance, public services, economic growth, scalability, stability, adequate service delivery, policy, rules and regulations in the sectors of Land use, land management, governance and institutions, taxation and revenue.

Chapter 6: Proposed Master Plan of Landi Kotal City

The progressive features of both sector and multi nuclei planning models have been utilized to prepare the proposed master plan for Landi Kotal city. The proposed master plan of Landi Kotal city is provided in below map.

Given the trend of development, the proposed future development intends to alleviate the pressure on the existing land uses. The areas beyond the main road are recommended to be reserved for future economic activities. Thus, proposed Landi Kotal master plan 2040 includes area along the road to be proposed as an economic corridor/mixed use zone.

The overall structure of the plan is in sectoral form, with the existing major road, serving as a main transportation corridor, with future development either side. Furthermore, the intersection of this economic corridor/mixed use zone help in forming different sectors.

The total area of Landi Kotal urban center is 10.43 sq. km. out of which 4.76 sq. km. is covered by a built-up (including roads) serving population of 37,588 persons with an average household size of 7.32 in 2022. Keeping in view the population and area occupation, the total extent of the proposed additional land use area including livestock and diary development zone is 0.13 sq. km. for a population of 55,513 by 2040.

New towns and infill development have been proposed with the proposed industrial areas as these land uses complement each other, the residential zones are proposed along the main economic corridor looking at the ribbon development pattern, however, if planned in an organic form, the ribbon development can alleviate the pressures on the existing mushroom growth. Table 6-1 shows the details of each proposed land use zone:

Table 6-1: Land Allocation for Proposed Land Uses in Landi Kotal City

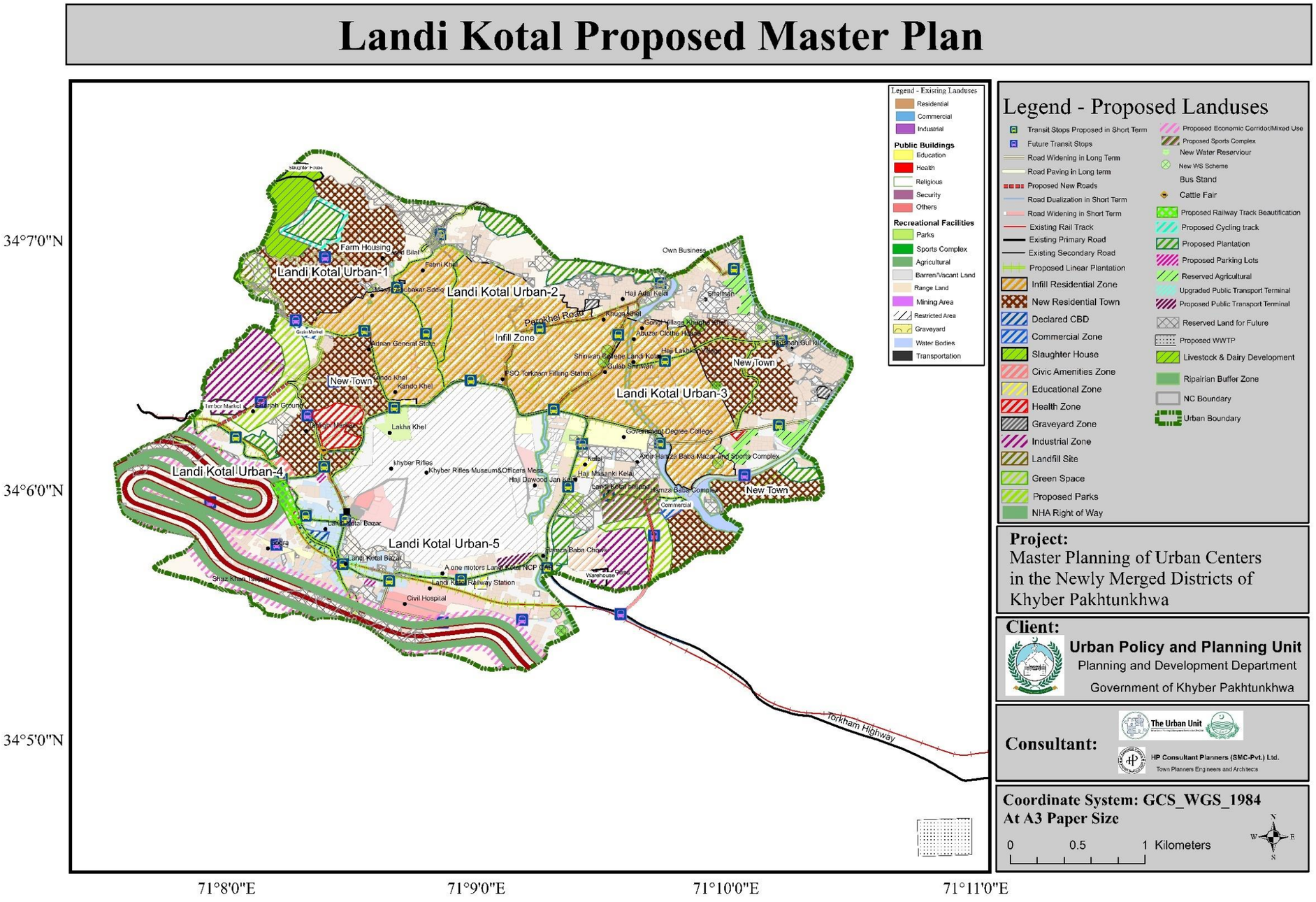
Proposed Land Use (Recommended area is based on multiplying percentages with the total area which is 10.43 sq.km.)	NRM Standard % for 50000-99000 population range	Recommended Area – min (sq. km.)	Recommended Area – max (sq. km.)	Existing Land Use Area (sq. km.) (2021)	Required (Recommended Area (min) – Existing Land Use) (Sq. km)	Required (Recommended Area (max) – Existing Land Use) (sq.km)	Proposed Area (sq. km.)
Residential Zone	27 to 43	2.8	4.48	2.29	0.52	2.19	2.09
Commercial Zone	1 to 5	0.1	0.52	0.23	-0.13	0.29	0.01
Industry Zone	2 to 20	0.21	2.08	0	0.21	2.08	0.3
Green Space (recreational open spaces)	1 to 6	0.1	0.63	0.09	0.01	0.54	1.17
Civic Amenities (Institutional)	3 to 11	0.31	1.15	0.37	-0.06	0.78	0.02
Graveyard	0.5 to 6	0.05	0.63	0.04	0.01	0.59	0.018
Economic Corridor/Mixed Use Zone	-	-	-	-	-	-	0.38
Reserved Agriculture	-	-	-	-	-	-	0.07
Livestock and Dairy Development Zone	-	-	-	-	-	-	0.13
Landfill							0.019
Reserved for future	-	-	-	-	-	-	1.009

Source: Recommended by the Consultants using NRM standards

Total available area for future development is 5.21 sq.km. The total proposed area is 3.819 sq.km which includes residential, commercial, mixed use/economic corridor, etc. 1.009 sq. km area is allocated for the future permitted extension zone.

Adjacent agricultural land to contiguous build-up converts to other land uses, such as residential and commercial, because 100% of agricultural land cannot be maintained for use in agriculture due to future city expansion. However, by 2040, the 0.07 square kilometers of agricultural land will be reserved as agriculture land.

The proposed land uses do not include land reserved for agriculture and green space areas because these areas are protected and cannot be converted to other uses in the future. Green spaces are reserved as these spaces improve the livability of city as well as help to remove pollutants and improve air quality by absorbing harmful substances.



Map 13: Proposed Master Plan of Landi Kotal

Source: The Urban Unit

The sector-wise recommended proposals and their future implications on each sector have been discussed in the sections below:

6.1. Residential Zone

One of the key features of the proposed master plan is the provision of suitable housing for all income groups. The residential areas have been proposed keeping in mind the increasing population and housing needs of Landi Kotal.

Proposals for the housing sector include guidelines for residential development, proposals for infill housing, and new housing. These proposals with consideration to the aforementioned strategies such as institutionalization, compact development and sustainable infrastructure. As a result, structurally safe, economical and sustainable housing is to be provided in Landi Kotal in order to improve the quality of life by 2040.

The institutionalization strategy focuses on the guidelines for future residential development which include permitted, permissible and prohibited uses to control urban sprawl and haphazard development. Effective regulation leads to efficient and effective delivery of better housing standards.

The compact development strategy focuses on the infill and new housing spatially distributed in Landi Kotal.

In 2021, the existing population of 36,791 resided in 2,744 housing units in Landi Kotal. The projected population for 2022 shows a population of 37,588. The housing backlog can therefore be calculated using the existing population, housing supply, and replacement demand (katcha and dilapidated and overcrowded.

The backlog calculation reveals a gap of 2,359 units between the existing housing supply and demand for the year 2022.

Table 6-2: Housing Shortage 2022, Landi Kotal

Year	Projected Population	Projected Household Size	Projected Housing Demand	Projected Housing Supply	Backlog	Overcrowding + Dilapidated	Total Shortage
2022	37,588	7.32	5,135	2,776	2,359	2,143	4,502

Source: Calculated by Urban Unit and HP Consultants

Housing backlog is relatively average in case of Landi Kotal city, however, any housing unit with 4 walls is considered as basis for calculations in PBS. Generally, conditions

and infrastructure vary from good to worse in existing housing units. Given the conflicting nature of the project area, most of the housing units are in dilapidating condition and keeping in view the projected household size of 7.32 (2022), are mostly overcrowded.

This makes total of 2632 houses are in urgent need of replacement to effectively accommodate the people and safeguard the social security as well as the lives of its inhabitants.

Similarly, the calculations have been done for the year 2040, shown in the table below:

Table 6-3: Housing Demand 2040, Landi Kotal

Year	Projected Population	Projected Household Size	Projected Housing Demand	Projected Housing Supply	Backlog	Overcrowding + Dilapidated	Total Shortage
2040	55,513	5.67	9,797	3,409	6,388	2,632	9,020

Source: Calculated by Urban Unit and HP Consultants

The residential areas have been proposed with regards to the increasing population and need for housing for Landi Kotal. The housing demand of Landi Kotal urban center for a 20-year planning period can be fulfilled through compact development, which provides more efficient land use, increased density, and affordability in the housing sector.

Table 6-4: Residential Zone Requirements

Existing area (sq. km.)	2.29
Existing area (in %)	**21.96%**
Household size (Census, 2017)	7.86
Household size (Land Use Survey, 2021)	7.43
Household size rate of change	-1.41%
Estimated Household size, 2022	7.32
Existing number of houses	2,744
Recommended NRM standard	27% to 43%
Recommended residential area – min (sq. km.)	2.81
Recommended residential area – max (sq. km.)	4.48
Required (Recommended (min) – Existing Land Use)	0.52

Required (Recommended (max) – Existing Land Use)	2.19
Proposed area 2040 (sq. km.)	2.09
Estimated Household size, 2040	5.67
Proposed new housing units	9,797

Source: Recommended by Urban Unit and HP Consultants

The existing area for residential use is 2.29 sq.km. with a household size of 7.43 (land use survey, 2021) with 2,744 existing housing units. The proposed area required for 2040 is 2.09 sq.km. with an estimated household size of 5.67 and the proposed new housing units are 9,797. The projected household size for Landi Kotal city is lower than the national household size for KP because the household size rate of change for the previous 2 censuses is in negative. Moreover, the method to calculate the household size rate of change using 3 censuses could have been used for a better trend analysis, however, the similar data for Landi Kotal city is not available for year 1981. Thus, the consultants have used the same projected household size for year 2040 for future residential development.

The residential zones are proposed to be further categorized into new towns and infill development to cater the housing demand of Landi Kotal city.

Table 6-5: Categories in Proposed Residential Zone

Land Use Class	Categories	Area (sq.km)
Residential Zone	New Town	1.18
	Infill Zone	0.91

Source: Urban Unit and HP Consultants

6.1.1. Income Group Classification

Income Groups are often categorized according to their financial standing in a country. They are generally categorized in lower, middle, or upper strata/class depending on their housing conditions, lifestyle and net worth. It is noted that the minimum wage was increased from PKR 21,000 to PKR 25,000 per month for unskilled workers in Khyber Pakhtunkhwa on 01 July 2022 [1].

According to the HIS survey, 73% of the population in Landi Kotal is categorized as low-income, while 21% of the population is in the middle-income class and 6% belongs to high-income class. Table 6-6 shows the different income group percentages based on the monthly income.

Table 6-6: Household Income Groups based on Monthly Income

Monthly Income Level	Percentage (%)
Below Rs. 10,000	6.4
Rs. 10,001 - Rs. 20,000	46.6
Rs. 20,001 - Rs. 30,000	20.2
Rs. 30,001 - Rs. 40,000	12.7
Rs. 40,001 - Rs. 50,000	7.9
Rs. 50,001 - Rs. 100,000	3.6
Rs. 100,001 & above	2.6
Total	100

Source: Calculated by Urban Unit and HP Consultants

The above noted income groups have been used to segregate the housing demand into number of units to be provided for each class in Landi Kotal.

Table 6-7: Housing units for each income class

Types According to income level	Population (%)	Housing units (2021)	Housing units (2022)	Housing units (2040)
Low Income	73.7%	3,673	3,754	7,162
Middle Income	21.1%	1,040	1,063	2,028
High Income	6.2%	312	318	607
Total	100%	5,025	5,135	9,797

Source: Calculated by Urban Unit and HP Consultants

The housing units have also been calculated in terms of lot size (Marlas) for each income group.

Table 6-8: Marla wise percentage for each income group

Size category	Income class (%)	Income Groups
Up to 9 Marla Units	73.7%	Low Income Group
10-17 Marla Units	21.1%	Middle Income Group
17-30 Marla Units	6.2%	High Income Group
Total	100%	

Source: Calculated by Urban Unit and HP Consultants

Three types of housing units have been proposed in the new towns and infill development zones for each income group:

- Low Income class: Up to 9 Marla Units
- Middle Income class: 9.1 - 17 Marla Units
- High Income class: 17.1 - 30 Marla Units

The percentages allocated for each housing unit are provided in Table 6-9 below:

Table 6-9: Housing units required by 2040 in Landi Kotal

Income Group Class	Size category	Percentage	Housing units required in 2040	Area (Sq. Km.)
Low Income	Up to 9 Marla	73%	7,152	0.94
Middle Income	9.1 – 17 Marla	20.6%	2,018	0.72
High Income	17.1 - 30 Marla	6%	607	0.37
Grand Total		**100%**	**9,797**	**2.03**

Source: Calculated by Urban Unit and HP Consultants

These percentages have been calculated from the existing percentage of the household income groups, and projected on the total housing units. For example, 73 % of the 9,797 to acquire low income Marla wise housing units required in year 2040.

The residential density of the study area is 4,826 housing units per sq.km by 2040. The KP Urban Policy, 2023 has been consulted to use densities for future residential development. According to the policy, the Landi Kotal urban area resides in the southern zone of KP and its density targets for private housing schemes shall therefore be prescribed by LGE and RDD.

Farm Housing

Farmhouses located on agricultural land and designed to function around a farming lifestyle. Farm housing having an area of 0.14 sq.km is proposed near the Landi Kotal Road to enjoy the nature and develop sense of community in the Landi Kotal Urban Center.

6.1.2. Rationale for Proposed Infill Development in Landi Kotal

The rationale for proposing the infill development in Landi Kotal is provided in Section 3.3.3. However, further explanation is provided in this section.

Infill development has been proposed around the city center and on the East, due to the availability of vacant land parcels within the existing built-up areas. Infill development encourages the usage of underutilized or vacant land in existing urban areas to increase density and place new development near existing resources and infrastructure. This helps cities like Landi Kotal be environmentally friendly and socially sustainable.

The Infill housing has been provided to fit within an existing neighborhood without significantly altering its character or appearance and control the urban sprawl in the area. The total area categorized under vacant plots is 2.27 sq.km. out of which approximately 1.13 sq. km is proposed to be used for infill development.

6.1.3. Rationale for Proposed Residential Development in Landi Kotal

Proposed new zones and infill zones are based on the ground realities, tribal system, cultural norms, and traditions. The proposals are distributed such that all communities of the area are served and unidirectional growth of the city is avoided. The following parameters have been used to identify residential development zones in Landi Kotal.

Proximity to Existing Residential Area

Proximity to existing residential land provides infill zones and new residential areas with advantages such as community living which promotes social interaction and community integration by considering the mix of housing types.

Proximity to Primary Roads

Residential development often follows major transportation arteries due to the precedence of ribbon development. It is however recommended to prioritize infill development in such areas. In addition, these areas offer high visibility and accessibility, making them attractive for mixed use development.

The areas along main roads have been proposed as new residential zones as these areas will be filled in the future. Therefore, a restrictive land use and zoning will not only contribute to the efficient use of land but aid in the urban regeneration of the area.

Proximity to Secondary Roads

Proximity to secondary roads is important they are often more accessible to people living farther from the main arteries. They are also less congested than major arteries and located in established neighborhoods.

Proximity to Existing Commercial Land

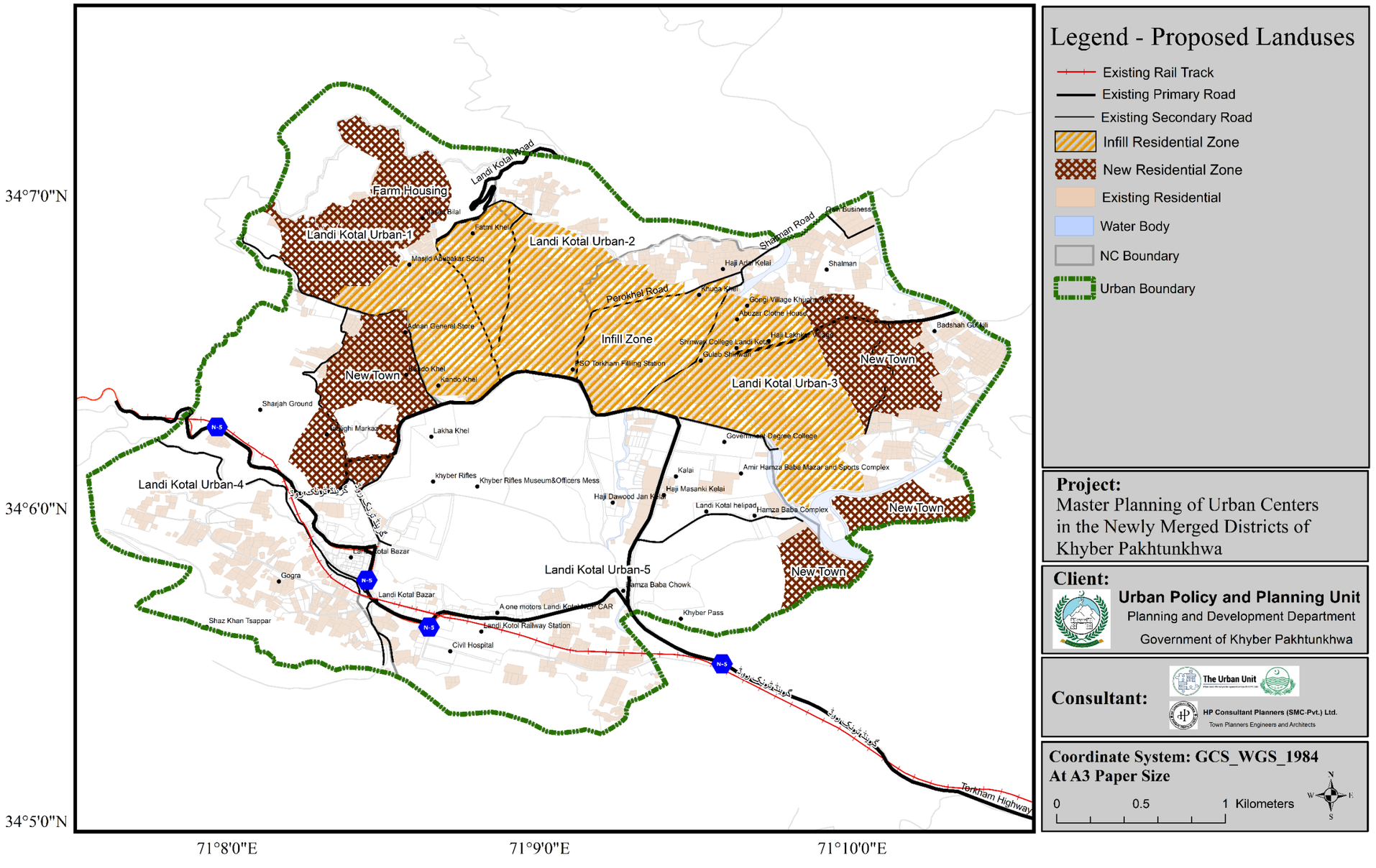
Proximity to existing commercial land provides new residential areas with the advantage of lesser daily commuting and accessibility to public services and amenities.

Lands proximal to industrial areas

Proximity to industrial areas can play a diversifying role in new residential zones especially for low cost housing. New towns on lands proximal to industrial areas are proposed to provide ease in daily commuting for the lower income class. These zones will have higher percentages of low-income plots to accommodate more population under the low-income category.

Additionally, close proximity industrial areas provide industries a large pool of skilled labor and subsequently more job opportunities with influx of economic activity.

Landi Kotal Proposed Residential Zones



Legend - Proposed Landuses

- Existing Rail Track
- Existing Primary Road
- Existing Secondary Road
- Infill Residential Zone
- New Residential Zone
- Existing Residential
- Water Body
- NC Boundary
- Urban Boundary

Project:
Master Planning of Urban Centers in the Newly Merged Districts of Khyber Pakhtunkhwa

Client:
Urban Policy and Planning Unit
Planning and Development Department
Government of Khyber Pakhtunkhwa

Consultant:
The Urban Unit
HP Consultant Planners (SMC-Pvt.) Ltd.
Town Planners Engineers and Architects

Coordinate System: GCS_WGS_1984
At A3 Paper Size
0 0.5 1 Kilometers

Map 14: Proposed Residential Zones

Source: The Urban Unit

The land use division for New Residential Schemes in provided in the below Table. Note that this is in accordance with the KP Local Government Private Housing Schemes Management and Regulations, Rules 2020:

Table 6-10: Planning Standards for Private Housing Schemes

Sr. No.	Land Use	Category D (up to 50 kanal)	Category C (50-100 kanal)	Category B (100-200 kanal)	Category A (200-500 kanal)	Mega Housing Scheme (above 500 kanal)
1.	Open Spaces	-	Min 05%	Min 07%	Min 07%	07% or above
2.	Graveyard	-	-	Min 02%	Min 02%	Min 02%
3.	Commercial	-	Max 01%	Max 05%	Max 05%	Max 10%
4.	Public Buildings	-	Min 02%	02% to 10%	03% to 10%	04% to 10%
5.	Size of Residential Plot	Max 01 kanal	Max 02 kanal	Max 02 kanal	Max 02 kanal	Max 02 kanal
6.	Internal Roads	25 ft Min	25 ft Min	Min 30 ft	Min 30 ft	Min 30 ft
7.	Site for Solid Waste	-	Min 05 marla	Min 10 marla	Min 01 kanal for 200 kanal and 10 marla for each additional 100 kanal up to 500 kanal	Min 04 kanal for 500 kanal and 02 kanal for each additional 500 kanal
8.	Grid Station Exclusive of	-	-	As per requirements	As per requirements	As per requirements

Sr. No.	Land Use	Category D (up to 50 kanal)	Category C (50-100 kanal)	Category B (100-200 kanal)	Category A (200-500 kanal)	Mega Housing Scheme (above 500 kanal)
	Public Buildings			of concerned dept./Agency	of concerned dept./Agency	of concerned dept./Agency
9.	Major Roads	Min 40 ft	Min 40 ft	Min 60 ft	Min 100 ft	Min 150 ft
10.	Service Area / Scheme Office		Min 05 marla	Min 10 marla	Min 10 marla	Min 01 kanal
11.	Low Cost Housing	-	-	-	Min 5%	Min 5%

It is recommended to implement these private housing scheme rules in Landi Kotal in order to prevent mushroom and unplanned growth of residential areas. These can be slightly amended given the area of land parcels proposed for residential land uses. As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repeal if Building Control Authority Notify any Land Use Classification Rules applicable in KP.

Table 6-11: Residential Area Development Guidelines

Permitted Uses	Allied Permissible Uses	Prohibited Uses
Detached/semi-detached dwellings, Mosques, Primary/high schools, Clinics/dispensaries, Social/cultural institutions, Local shopping areas/retail shops, Offices of professionals with adequate parking facilities, Parks and playgrounds, Apartment buildings, Graveyard or place of burial, horticultural nursery, Urban farm, Old age home or orphanage, Urban forest, Guest houses offices of TMAs/other tiers of local Govt.	Commercial offices and service, Shops of local character, Raising of poultry for non-commercial purposes, Day-care centre, Pre-schools, Rehabilitation centres for disabled, Primary and junior schools, Petrol pump, Gas filling station, Taxi/rickshaw stand.	Heavy, large and extensive industries: noxious, obnoxious and hazardous industries, Warehousing, storage go-downs of perishables, hazardous, inflammable goods, Workshops for buses, Slaughter-housing, wholesale mandis, Sewage treatment plant/disposal work, Water treatment plant, Solid waste dumping yards, Outdoor games stadium, Indoor games stadium, shooting range, Zoological garden, botanical garden, Bird sanctuary, Picnic hut,

Permitted Uses	Allied Permissible Uses	Prohibited Uses
		International conference centre, Sports training centre, reformatory and all uses not specifically permitted or permissible

Source: Urban Unit and HP Consultants

6.2. Commercial Zone

Landi Kotal is close to the Afghanistan border and hub of commercial activity with semi-rural characteristic which has recently been declared as an urban area.

6.2.1. Commercial Area Growth, Gaps and Regulations

Using the guidelines given in the NRM standards, the current commercial area gap has been calculated below:

Table 6-12: Commercial Zone Requirements

Existing area (in sq. km.)	0.23
Existing area (in %)	2.18%
NRM Standards	1%-5%
Recommended commercial area – min (sq. km)	0.10
Recommended commercial area – max (sq. km)	0.52
Required (Recommended (min) – Existing Land Use)	-0.13
Required (Recommended (max) – Existing Land Use)	0.29
Proposed area 2040 (in sq.km.)	0.01

Source: Recommended by Urban Unit and HP Consultants

As per the land use survey (2021), there are 56.8 acres of commercial area in Landi Kotal urban center.

This suggests that Landi Kotal requires more commercial land to cater to the needs of the residents for the next 20 years. This is further demonstrated by the fact that the housing growth over the past five years, 2016-21 has been almost 50 percent.

Additionally, there is a need to regulate commercial areas by providing appropriate parking, loading/unloading facilities and better land uses to accommodate the commercial and mixed-use activities.

Mixed Use Development/Economic Corridor

Economic corridors/ Mixed-use development is a new form of urban development that can increase the economic growth of area. It provides various benefits, such as cost-saving infrastructure, increased tax revenue, property value, tax collections, and promotes tourism etc. it also strengthens infrastructure construction by establishing industrial clusters, thereby attracting investment and developing regional economy. Mixed-use zone having an area of 0.38 sq. km is suggested parallel to the N-5 Road.

6.2.2. Strategy to Cope with Haphazard Commercialization

Haphazard commercialization results in acute parking problems, traffic congestion and adverse environmental impacts in the historical core & neighboring residential areas around commercial activities. To address this, it is recommended to formulate a strategy to meet the demand for commercial uses with minimal impact on the environment and quality of residential areas.

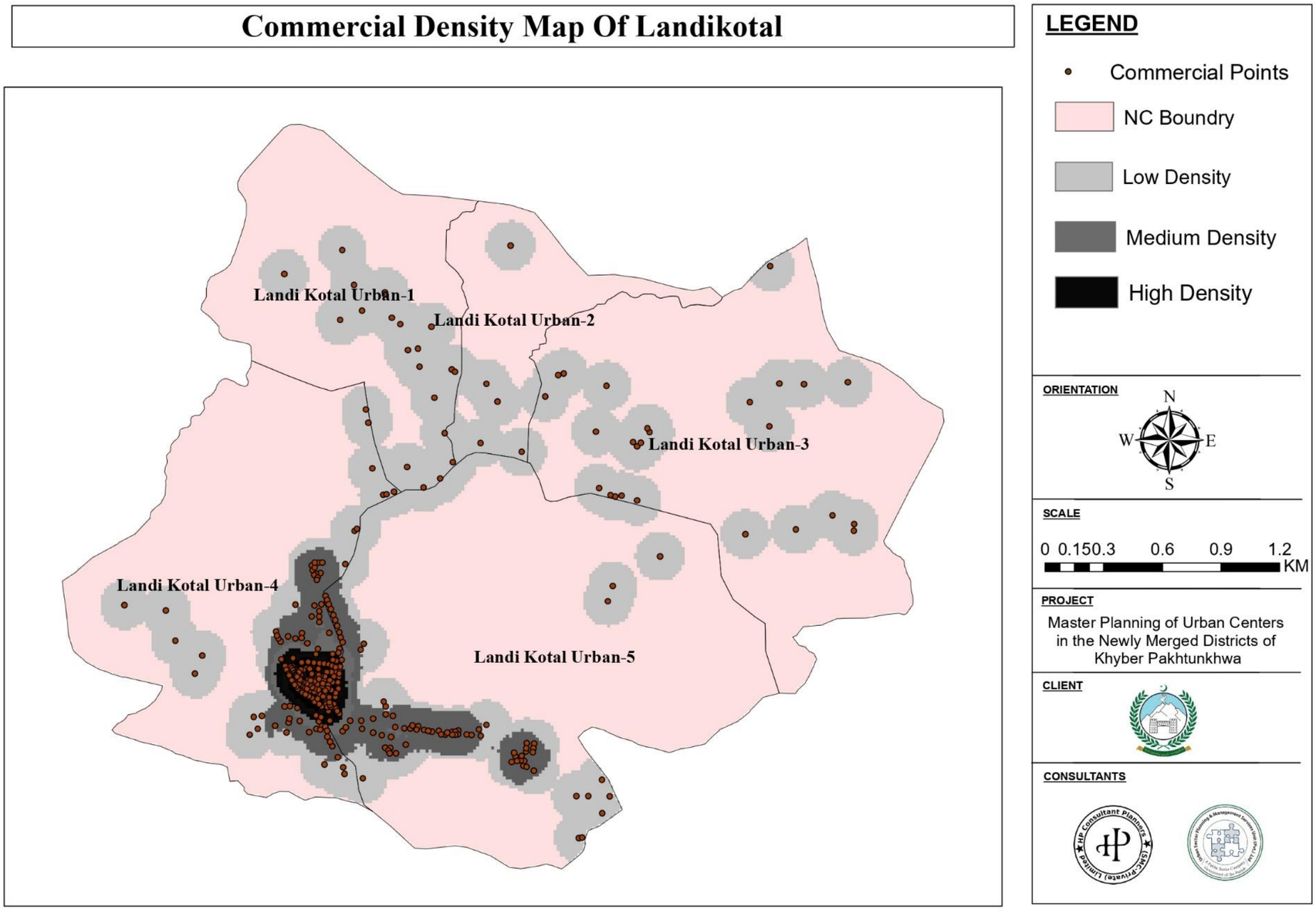
In addition, the commercialization strategy must ensure that no unplanned commercial areas are encouraged to emerge and flourish. For effective implementation, the strengthening of planning agencies in terms of trained staff and resources is required.

Commercialization along roads declared for this purpose should only be allowed if proponents meet the necessary parking demands and the provisions to manage the increased traffic load.

6.2.3. City Strategy

The provincial government and its line departments in the area should support the commercial activities of Landi Kotal and develop town-specific interventions (town-centre) for each of its five neighbourhood councils. Landi Kotal NC 4 and 5 have the highest density and have seen the highest growth over the last decade.[8] Below map shows the commercial density of the study area.

[8] Year-Wise Housing Growth in Landi Kotal Urban Area, Field Survey 2022



Map 15: Commercial Density of Landi Kotal Urban Area, 2021
Source: The Urban Unit

Some of the strategies to be followed in the study area are mentioned in the table below:

Table 6-13: Strategies to be proposed in each Town of Landi Kotal

Town	Strategies	Justification
Landi Kotal NC 1, 2 and 3	Will function as sub commercial areas to share the burden of Main Bazaar in Landi Kotal in terms of retail commercial activities while servicing nearby commercial facilities.	Right now, the main bazaar in Landi Kotal has high commercial density and is focal for commercial activity in Landi Kotal. Landi Kotal-1 and 3 have medium density residential area with lesser presence of commercial activity. Small commercial markets can be made in these areas to promote polycentric development for daily access shops i.e., retail shops.
In all major arteries leading to Landi Kotal	Developing public transport infrastructure, while making public spaces walkable to reduce reliance on private vehicles.	Efficient public transport system is basis for any urban centric development. It enables easy accessibility to market for all. This also allows for controlling of emissions, resulting in better air quality, and making the study area environmentally friendly for the residents.
Commercial Areas of all NC	Implementing strict regulations and rules for sustainable commercial development, while creating awareness and support environment to ensure such practices	Increased housing demand in the area means that the commercial density is likely to increase in the future and as such following policies like mixed-used development and vertical

Town	Strategies	Justification
		commercial development are sustainable
Landi Kotal-1 and 5	Setting the direction of new commercial area growth in line with that of residential growth	These areas are where the residential growth trend is, and as such we need to ensure commercial area is developed in line with the NRM standards
Major Landi Kotal Bazaar	Conducting regular traffic studies and implementing traffic management measures to prevent congestion and improve safety in commercial areas.	Parking demand and supply mismatch can lead to disintegration of commercial activity and disincentivize business growth as access to doing business decreases in the areas
CBD Landi Kotal	Tax Schemes to incentivize establishment of new commercial areas in the study area	This suggestion is withdrawn
Landi Kotal-1 and 4	Incentivizing vertical building design, especially in high density areas	High density areas today must move to a vertical development model to ensure sustainable land use practices. High density residential areas should be allowed higher FAR for future developments.

In addition to the above, the following strategies and practices must be adopted to allow for sustainable commercial development in all areas of Landi Kotal:

- Providing incentives and support for businesses to locate in designated commercial centres, such as tax breaks and grants for building improvements. (CBD Tax incentives)

- Strengthening planning agencies and increasing their capacity to effectively regulate and manage commercial development.
    - Strengthening of local government and provision of trained staff and resources to pursue and implement sustainable development plans
- Educating businesses and the public about the importance of sustainable and planned commercial development.
    - Encouraging sustainable expansion of commercial areas while preventing haphazard development.
    - Providing adequate parking spaces and managing increased traffic load.
    - Mandating vertical expansion of commercial areas to make efficient use of land.
    - Encouraging the use of environmentally friendly technologies and practices in commercial development.
    - Promoting mixed-use development to integrate commercial and residential areas.

6.2.4. Criteria for Declaring Roads as Economic/ Mixed Use Corridor

Economic corridors are meant to attract investments and generate economic activities in contiguous regions. Notably, the existence of an efficient transportation system plays an essential role in realizing this. Corridors are also critical components of property and sales tax revenue generation for local jurisdictions. Their success has a direct correlation with the success of municipalities as they can lead to promoting economic development in the nearby municipalities. Landi Kotal is close to the Afghanistan border and has significant potential to contribute to the national economy. Therefore, the economic corridor has been proposed based on the following Parameters.

- Prime Location of Landi Kotal

Landi Kotal is located at a prime location. Landi Kotal tehsil is bordered by Landi Kotal tehsil on the East, Yake Ghund tehsil of Momand District on the North, Muhmand Dara District of Afghanistan on the West and Bara tehsil on the South. This geographical location invites regional network integration, which can be boosted through an economic corridor. Pertinently, this location can prove to be a suitable route for trade entailing the exchange of goods and services in the region. Ultimately, this will support

the business ventures in Landi Kotal and subsequently, will lead to enhancing people's well-being, promoting domestic peace, and improving regional economy.

- Corridor Parallel Torkham Highway

Economic Corridor has been proposed parallel to the Torkham Highway Road. The economic development often follows major transportation arteries because these areas offer high visibility and accessibility, making them attractive to businesses and consumers.

- Afghan Trade Transit Connectivity with Corridor

Afghan Trade Transit is an important route that will open trade for Pakistan for Middle East and will ease customs process with lesser time consumption. The existence of an economic corridor will improve infrastructural development and modernize transportation networks. It will also cause a shift from an agriculture-based economic structure to the emergence of an industrial-based economy in the region. Also, through establishment of this corridor, a route to dry ports and export procession zones can be developed that will attract revenues for local residents of both countries.

6.2.5. Rationale for Future Commercial Development in Landi Kotal

The suitability of different land use parcels is based on different layers/ parameters which are discussed below.

Proximity to Primary Roads

Economic development often follows major transportation arteries as these areas offer high visibility and accessibility, making them attractive to businesses and consumers. The presence of transportation infrastructure such as roads, highways, and public transit increases the mobility of people and goods, which can stimulate economic growth and development.

Proximity to Secondary Roads

Commercial areas along secondary roads are more affordable for small business development as the land is cheaper. Moreover, secondary roads being located in established neighborhoods provide businesses with opportunities to tap into existing communities and local customer bases.

Proximity to Existing Commercial Land

Proximity to existing commercial land can provide new commercial areas several advantages including market synergies, increased visibility, reduced competition, and eased development, which can help support economic growth and development.

Proximity to industrial areas

Proximity to industrial areas play a significant role in commercial area as their location can give businesses access to goods and services, a large pool of skilled labor, and major transportation arteries. Additionally, the presence of industrial activities in the area can generate increased demand for goods and services, creating synergies between commercial and industrial activities.

Lands proximal to residential areas

Proximity to residential areas is crucial for commercial area development as it offers access to a customer base and supports local economic growth. Nearby residential areas provide a steady flow of customers, as well as opportunities for businesses to cater to local needs. Additionally, proximity can lead to the creation of walkable communities with easy access to goods, services, and employment.

Lands proximal to major transit points (bus stands, railway station, shopping malls etc.)

Proximity to transit points is beneficial for commercial area development as it offers businesses access to a larger customer base and improved transportation options. It also helps increase foot traffic and drive business growth. Additionally, transit-oriented development can encourage the creation of compact, walkable communities that support sustainable transportation and reduce dependence on personal vehicles.

Lands proximal to existing municipal infrastructure services

Proximity to municipal services is important as it provides businesses with access to essential infrastructure and services that support their operations. Access to municipal services such as water and sewer systems, waste management facilities, and emergency services help reduce costs and improve operational efficiency. Additionally, proximity to municipal services provide businesses with access to local government resources and support.

6.2.6. Future development Plans and Key Actions

In the case of Landi Kotal, the focus of future planning is on addressing the challenges of haphazard commercialization and promoting sustainable and planned commercial development. This can be achieved through a combination of regulatory measures, incentives, and support for businesses, as well as investments in infrastructure and other resources.

In the short term, implementing measures to regulate and manage commercial development in Landi Kotal should be prioritized. This includes strengthening planning agencies, developing and enforcing regulations and standards for commercial development, and providing incentives and support for businesses to locate in designated commercial centers. Additionally, traffic management measures should be implemented to address congestion and improve safety in commercial areas.

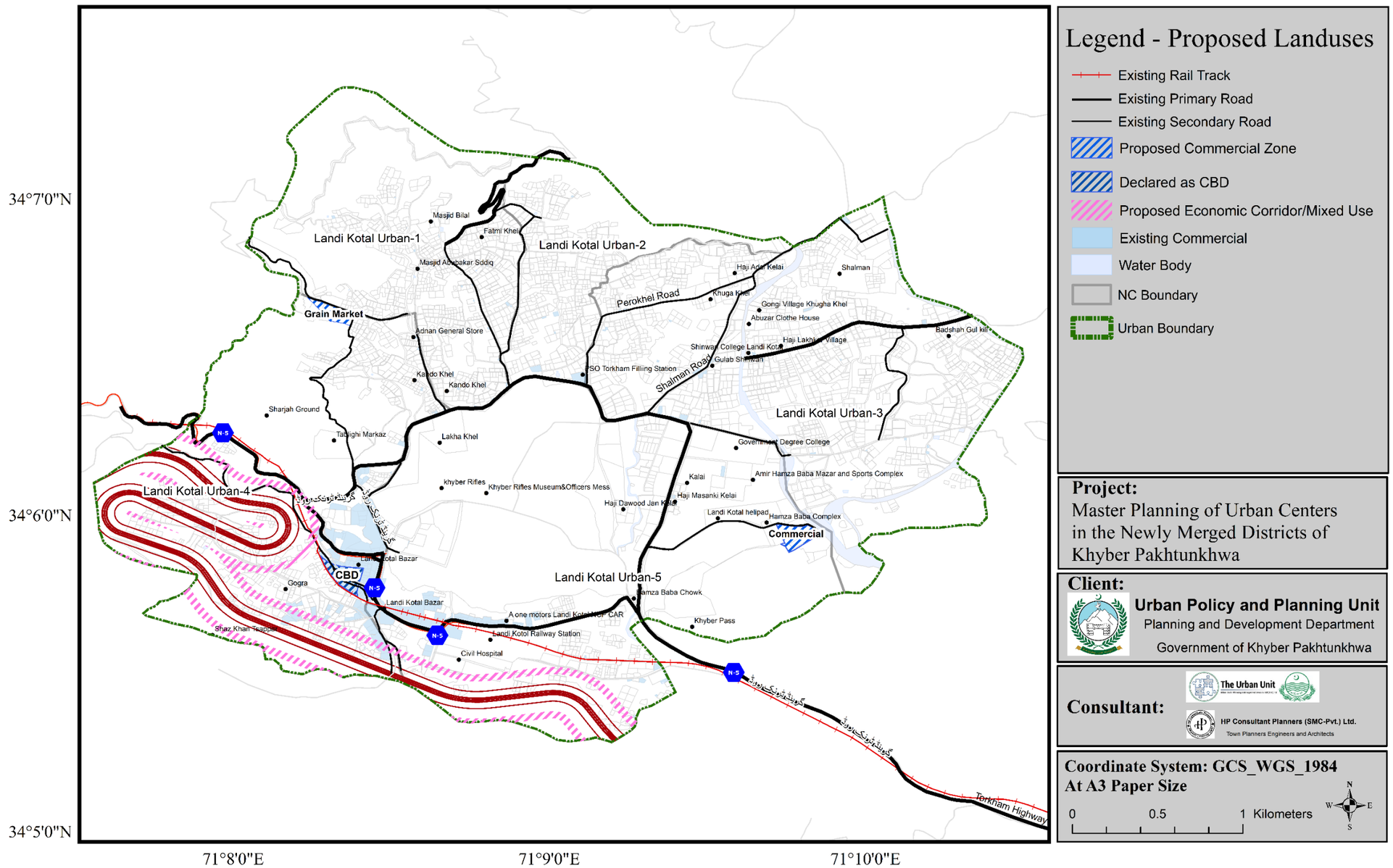
In the medium term, the focus should be on promoting sustainable and planned commercial development in Landi Kotal. This can include encouraging the use of environmentally friendly technologies and practices in commercial development, promoting mixed-use development to integrate commercial and residential areas, and investing in public transport infrastructure to reduce reliance on private vehicles. Regular assessments and evaluations of commercial development should be conducted to ensure compliance with regulations and address any issues.

The long-term goal should be to create a sustainable and vibrant commercial environment in Landi Kotal. This includes implementing a comprehensive zoning plan that clearly defines and separates commercial, residential, and industrial areas, and promotes the growth and development of commercial centers in Landi Kotal.

Investments in infrastructure, such as roads and public transportation, should be prioritized to support the growth of the commercial sector. Regular assessments and evaluations should continue to be conducted to ensure that the city's commercial development is meeting the needs of the community and supporting economic growth

Map 18 illustrates the proposed commercial areas of Landi Kotal based on the suitability analysis and the organic commercial growth in the study area over time.

Landi Kotal Proposed Commercial Zones



Legend - Proposed Landuses

- Existing Rail Track
- Existing Primary Road
- Existing Secondary Road
- Proposed Commercial Zone
- Declared as CBD
- Proposed Economic Corridor/Mixed Use
- Existing Commercial
- Water Body
- NC Boundary
- Urban Boundary

Project:
Master Planning of Urban Centers in the Newly Merged Districts of Khyber Pakhtunkhwa

Client:
Urban Policy and Planning Unit
Planning and Development Department
Government of Khyber Pakhtunkhwa

Consultant:
The Urban Unit
HP Consultant Planners (SMC-Pvt.) Ltd.
Town Planners Engineers and Architects

Coordinate System: GCS_WGS_1984
At A3 Paper Size
0 0.5 1 Kilometers
N W E S

Map 16: Proposed Commercial Zones

Source: The Urban Unit

6.2.7. Short Term Plan (2020-2025)

In light of the above criteria for declaring roads as commercial/mixed use zone, the following sections of roads are proposed as commercial.

Declare as Central Business Development

The majority of the major public and commercial structures in the Landi Kotal urban core are concentrated along NC 4 and the Torkham Highway. There should be a Central Business District (CBD) established for this location. By adhering to planning principles in service, building design, and traffic management, this CBD will foster rigorous civic and cultural, commercial, and business activities. In addition to supporting the inflow of taxes for the government, it will attract investment to the region and generate income for business communities.

Commercial Corridor

Based on the existing trend observed in Landi Kotal where the commercial development organically occurs around major commercial arteries, area parallel to Torkham Highway Road should be designated as a commercial corridor. Being located near major highways such as the TPR can help increase exposure and drive more customers to businesses. Additionally, proximity to primary roads can improve access for customers and employees, making it easier to reach businesses and reducing travel times. Improved access can also attract businesses and investment to the area, supporting economic growth and development.

6.2.8. Medium- and Long-Term Plan (2022-2040)

Urban Area Development Authority

Although the Tehsil administration is already in place, the urban area has been recently delineated and merged districts have become a part of the provincial government's jurisdiction. Therefore, formation of *Urban Areas Development Authority Khyber* under the Khyber Pakhtunkhwa Urban Areas Development Authorities Act, 2020 is eminent. The Authority must be responsible for the overall urban area with sole jurisdiction.

Extension of Landi Kotal Bazaar as Commercial Area

Landi Kotal bazaar has been the central area of the Tehsil and is characterized by its concentration of non-residential activities, high land values, administrative offices and presence of the commercial happenings.

Keeping in line with the organic demand and the historic value of the bazaar, the area surrounding Landi Kotal Bazaar has been zoned for future commercial development.

Formation of new areas in Landi Kotal-1 and Landi Kotal-3 as commercial zones

New commercial areas have been proposed in Landi Kotal based on the existing commercial demands. Landi Kotal-1 commercial area will act as the commercial market that will serve as the forward linkages for the industrial area proposed, and the new residential is also proposed in this area. This will also host activities for the warehousing and forward and backward linkages for Pak-Afghan trade through the study area.

Landi Kotal-3 will serve as the forward linkage for infill housing proposed, this will serve as the satellite for Landi Kotal commercial and residential demand as well as feed in/from trade happening via the proposed commercial corridor (See Map 16 above).

As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repealed if Building Control Authority Notify any Land Use Classification Rules applicable in KP.

The following guidelines for commercial areas are provided in Table 6-14

Table 6-14: Commercial Zone Development Guidelines

Permitted Uses	Allied Permissible Uses	Prohibited Uses
Commercial buildings, Large Markets, departmental stores and Outlets, Large Public Squares and Parks Bakery or confectionary, Clinic or polyclinic, Courier service or logistics office, Private telephone exchange or cable operation or mobile franchise offices, Park, Memorial and monument, Hotel or motel, Car showroom, Boutique or garment outlets or beauty parlour, Restaurant, Social welfare institutions such as community centre, art gallery and museum, Parking plaza or Parking site.	Pedestrian friendly streetscape, Mixed- use buildings, Technical and vocational institution, Seasonal commercial fare site, Stadium; amusement park / play land, Bus terminal, Fuel Stations, Wholesale market, Second hand goods market, Coal, wood or Timber yard.	Dwellings except those of service apartment, essential operational, watch and ward personnel, Heavy, extensive, noxious, obnoxious, hazardous and extractive industrial units, Hospitals/research laboratories treating contagious diseases, Poultry farms/dairy farms, Slaughter-houses, Sewage treatment/disposal sites, Agricultural uses, Storage of perishable and inflammable commodities, Quarrying of gravel, sand, clay and stone, Zoological garden, botanical garden, Bird sanctuary, Forensic science laboratory and all other activities which may cause nuisance and are noxious and obnoxious in nature.

Source: Urban Unit and HP Consultants

In conclusion, effective land use planning and the development of a comprehensive master plan for commercial and trade activities are crucial for the sustainable and prosperous growth of Landi Kotal region. By implementing zoning regulations, formulating sub-commercial areas, and providing incentives for businesses to locate in designated commercial centers, the local government can encourage sustainable and planned commercial development. Planned growth of commercial areas would

allow for NCs other than Landi Kotal 4 & 5 to share the burden of the main bazaar in Landi Kotal while making it easier to establish forward linkages for its products.

This Master Plan with its economic development strategy will help prevent haphazard commercialization and its negative impacts on the urban structure and environment. Additionally, institutional development and the creation of a data-driven ecosystem for the management and steering of commercial growth is crucial for Landi Kotal to capitalize on its strategic location and growing trade linkages with rest of the district and other neighboring districts.

6.3. Industrial Zone

Industrial zones are proposed with consideration to the locational requirements. The terrain is rugged, uneven and highly accessible by main roads like Torkham highway Furthermore, the proposed industrial zones are segregated from the existing and proposed residential areas with an appropriate distance as per the NRM standards.

The proposals are made in light of the aforementioned strategies of institutionalization, economic development, environmental conservation and sustainable infrastructure. The proposed industrial zones will have several positive impacts on economic growth, reduced environmental impact, improved public health, and increased social responsibility and innovation.

Owning to its proximity to the border, the industrial products-related needs can be met through industry present in Peshawar through goods from Afghanistan under the Afghanistan Transit Trade. Industries can be categorized based on indicators such as capital investment, labor requirements and level of mechanization used in a particular industry. The categorization may be as described as per the table below.[9]

Table 6-15: Criteria and Enterprise categories for Industries

Enterprise Category	Criteria (Annual Sales Turnover)
Small Enterprise (SE)	Up to PKR 150 Million
Medium Enterprise (ME)	Above PKR 150 Million to PKR 800 Million

[9] Integrated Master Plan for Multan (2008-2028), NESPAK – May 2012

Start-up	A small enterprise or medium enterprise up to 5 years old will be considered as Start-up SE or Start-up ME.

Source: SMEDA

The next table defines the area required for Industrial cluster, Small Industrial Estate, Large Industrial Estate, SEZ and Regional I.E. According to SEZ Act of Pakistan

Table 6-16: Required Area for Industry

Name	Industrial Cluster	Small I. E.	Large I. E
Area Required	2 Acre	50 Acre	100 Acre

Source: SMEDA

This criterion is applied for the development of economic zones in this region. The calculations in Table 6-17 are done for the master plan proposals of industrial area in Landi Kotal:

Table 6-17: Industrial Zone Requirements

Existing area (in sq. km.)	**0.0**
Existing area (in %)	0.0
NRM Standards	2% to 20%
Recommended industrial area – min (sq. km)	0.21
Recommended industrial area – max (sq. km)	2.09
Required (Recommended (min) – Existing Land Use)	0.21
Required (Recommended (max) – Existing Land Use)	2.08
Proposed area 2040 (in sq. km.)	0.30

Source: Recommended by Urban Unit and HP Consultants

6.3.1. Rationale for Proposed Industrial Area

According to the National Reference Manual (NRM), the following parameters are of primary importance for industrial planning in Landi Kotal urban area.

a) Location

- The industrial zone should be located on flat land to allow large plots and buildings with large spans.
- An area having no substantial natural vegetation.
- Industries should be on the downside of existing or proposed residential areas for the wind.

b) Accessibility

- The industrial zone should be located close to the primary and secondary roads.
- It should be at a distance of 220 feet (67 meters) from the middle of the highway.

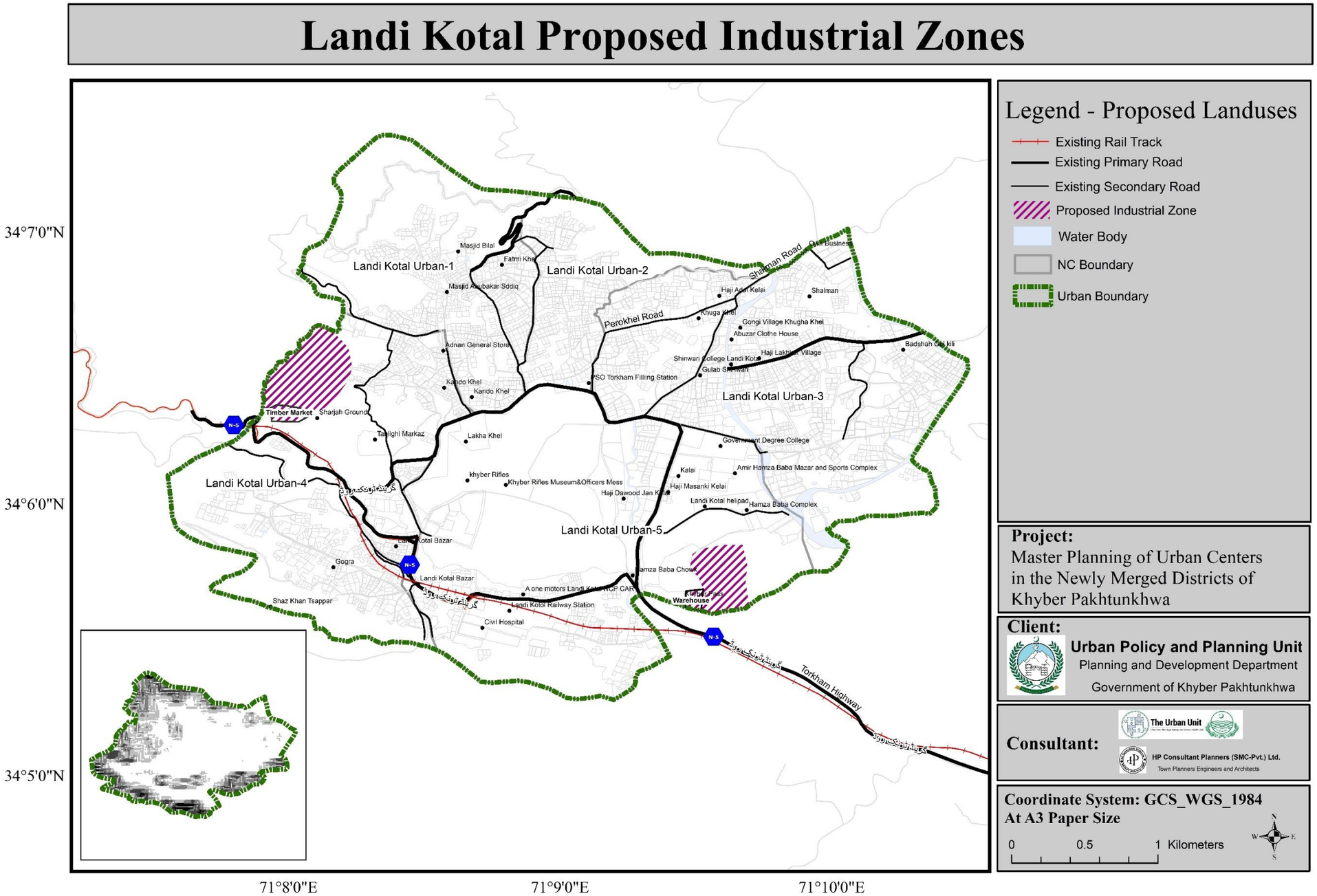
c) Segregation

- The industrial estate should be separated from the existing and proposed residential area by at least 150 meters (medium size units of light industry and warehouse) or at least 500 meters (large units of light and general industry).

6.3.2. Industrial Planning

An industrial area is proposed to meet both current and future requirements of the study area, taking into consideration existing conditions and anticipated needs. 2 industrial zones have been proposed given the absence of any industrial zones in Landi Kotal . one zone is located near the mining area and other is near the Torkham Highway.

These locations have been determined based on international best practices, the NRM Guidelines, and the local context. Timber market having an area 0.01 sq.km and warehouse having an area 0.01 sq.km are also proposed near Torkham Highway.



Map 17: Proposed Industrial Zones

Source: The Urban Unit

The proposed industrial zone is in accordance with the locational requirements of a relatively flat terrain and medium population density, high accessibility, and segregation from the existing and proposed residential area with appropriate distances as per the NRM standards.

As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repeal if Building Control Authority Notify any Land Use Classification Rules applicable in KP. The development guidelines for industrial areas are below:

Table 6-18: Industrial Zone Development Guidelines

Permitted Uses	Allied Permissible Uses	Prohibited Uses
Small and Medium Scale Industries Processing Units Manufacturing Activities Warehouses storage or Go-down; Workshops Cold storage and Ice factory Petro chemicals, petroleum and gas products	Showrooms Mixed- used buildings Residence for workers Fuel stations and Oil depot; Restaurant; Hospital; Auto workshop, service garage and service station;	Private residential housing schemes Large health, recreational commercial and educational institutions The land use for storing, packing, pursing, cleaning, preparing, and manufacturing of blushing power, ammunition, fireworks, gun powder, Sutphin, mercury, gases, nitro-compounds,

Loading and unloading space; Parking lot Industrial Park or estate Police station, fire station and post office; bank or automated teller machine (ATM); Industrial research institute; Treatment or recycling plant; Grid station; Vocational training institute		phosphorous, 'dynamite, explosives, bombs or any other obnoxious hazardous material shall not be permissible In a declared industrial area.

Source: Urban Unit and HP Consultants

6.4. Educational Facilities

Educational facilities have been proposed as part of the institutionalization and economic development strategies described in this master plan. The proposed facilities will have several positive impacts on literacy rates and subsequent economic and social development.

6.4.1. Rationale for Proposed Educational Facilities

Demography, connectivity and environmental factors are major contributors in spatial policy making, especially for matters concerning optimal locations for the provision of public services to ensure service accessibility and making its coverage more efficient and equitable. For the establishment of new schools: flood zone proximity, earthquake zone proximity, air and water quality and influential factors.

6.4.1.1 Locational Criteria

A study on educational facilities' guidelines in Saudi Arabia revealed that a Primary or Elementary school should serve a neighborhood of 3600 residents, with a service buffer zone of 500 meters. In addition, it suggested an elementary school should be

500 meters away from another elementary school; 150 meters from the closest highway or main road; 75 meters from the nearest road intersection or gas station; 150 meters from power transmission lines and 500 meters from any power transmission plant; 150 m from factories and warehouses; 100 meters from water catchment areas; and the land slope must be less than 18%[10].

Transport and connectivity are another key factor impacting student participation rates in formal education. The findings of a study conducted by Canadian department of Public Policy showed that distance to school may act as a deterrent to attending by virtue of relocation costs, especially if the student is from a low-income family. Moreover, increased distance to an educational facility from an individual's residence is associated with an access gap, leading to low student attendance accompanied with a high likelihood of dropping out[11]. Another study highlighted individuals residing more than 8 kilometers from an academic institution are 27 percent less likely to participate in post-compulsory education, compared to those who live less than 2 kilometers away.[12]

6.4.1.2 Population and Demographics

Population density is another key determinant in the establishment of new facilities as it is directly proportional to accessibility; Areas with a lower population density of school-age population have lower access while areas with a higher density of school-age population have higher access.

The current population of Landi Kotal is 36,782 based on the population projection of the 2017 census with an annual growth rate of 2.19. The data provided by DEO Khyber regarding education institutes are analyzed for the whole tehsil of Landi Kotal. The below-given table shows all the populations above the age of 10 by literacy, and sex. It implies that approximately 96% of the population have an education level of matric or below, wherein the percentage of females is very less.

[10] Saad Al Quhtani (2022) Spatial distribution of public elementary schools: a case study of Najran, Saudi Arabia, Journal of Asian Architecture and Building Engineering

[11] Frenette, Marc. "Access to College and University: Does Distance to School Matter?" *Canadian Public Policy / Analyse de Politiques* 30, no. 4 (2004): 427–43. https://doi.org/10.2307/3552523.

[12] Dickerson, A., & McIntosh, S. (2013). The Impact of Distance to Nearest Education Institution on the Post-compulsory Education Participation Decision. *Urban Studies*, *50*(4), 742–758.

Table 6-19: Education level in tehsil Landi Kotal

Level	Male	Female	Transgender
Below primary	71%	29%	0%
Primary	79%	21%	0%
Middle	93%	7%	-
Matric	96%	4%	0%
Intermediate	96%	4%	-
Graduate	94%	6%	-
Master and above	97%	3%	-
Diploma	89%	11%	-
Others	44%	56%	-

Source: Household Information Survey, 2021

Table 6-20: Education level in the urban area of Landi Kotal

Level	Male	Female	Transgender
Below primary	68%	31%	1%
Primary	70%	30%	-
Middle	86%	14%	-
Matric	66%	7%	-
Intermediate	93%	7%	-
Graduate	91%	9%	-
Master and above	94%	6%	-
Diploma	92%	8%	-
Others	65%	35%	-

Source: Household Information Survey, 2021

Gender disparity

Though at the primary level and middle level quite several schools are set up for both boys and girls however the gender disparity starts from high school and widens at higher secondary.

Table 6-21: Gender disparity in tehsil Landi Kotal for Male and Female schools

Schools	Boys	Girls	Gap
Primary	85	63	**22**
Middle	11	5	**6**
Higher	12	1	**11**
Higher Secondary	-	1	**-1**

Source: DEO Khyber

The total number of Primary Schools in the tehsil Landi Kotal is 148, of which 85 are for males whereas 63 are for females. Moreover, the population has been used as a yardstick to gauge the adequacy of primary schools. The allocation criterion recommended by NRM is that a two-section primary school should serve a population of 7,500. However, in the case of tehsil Landi Kotal, this population should be considered half of 7500 as currently, only single-section primary schools are available in Landi Kotal. While it is encouraging that there isn't a significant difference in the total percentage of students enrolled at the primary school level, however, the gap increases as the students climb the ladder towards the higher level of schooling. For instance, the enrollment of female students decreases at the middle level and higher levels. Similarly, the total number of educational institutions for male is higher than the same for females.

In the case of Landi Kotal, the enrolment of students starts declining from the middle level and widens at a higher level, especially in female schools. While the infrastructure gap persists and the same can be fulfilled on the basis of demand, therefore, there is a need for Government to work with communities and households to remove barriers to girls' education and promote gender equality in education. Because investing in girls' secondary education is one of the most transformative development strategies for any community.

6.4.1.3 NRM Standards for Educational Facilities

The areas required for different level of educational facilities with respect to population, gender, and the NRM guideline are provided in Table 6-23:

Table 6-22: NRM standards for Schools

Population (2017)	Projected Population (2040)	School level	Criteria for 1 school @ per Population[13]	Criteria for Required area @ per School[14]	Existing School	Schools required by 2040	Recommended School by 2040 (Required – Existing)	Required area in Hectare
33729	55,513	Primary	7,500	1	148	08	4	08
		Middle	3,900	1.5	16	14	2	21
		High/ Higher Secondary	23,000/ 30000	2.1	8	3/2	4	6.3/ 10

Source: National Reference Manual, 1985

Table 6-23: NRM standards-based criteria for educational facilities

Level of Educational Facility	Types	Population Served	Required Area Per School (Hectare)
Primary	Boys Urban	7,500	1
	Girls Urban	8,200	
	Boys Rural	7,500	
	Girls Rural	10,200	
Middle	Boys Urban	3,900	1.5
	Girls Urban	15,000	

[13] National Reference Manual on Planning & Infrastructure Standards, Chapter 6,
[14] National Reference Manual on Planning & Infrastructure Standards, Chapter 6,

Level of Educational Facility	Types	Population Served	Required Area Per School (Hectare)
	Boys Rural	3,900	
	Girls Rural	17,000	
High	Boys Urban	23,000	2.1
	Girls Urban	30,000	
	Boys Rural	27,000	
	Girls Rural	31,000	
Colleges	Male Rural	200,000	8
	Male Urban	400,00	
	Female Rural	250,000	5
	Female Urban	750,000	

Source: National Reference Manual, 1985

6.4.2. Middle schools

There are 16 Government Middle schools operating in the tehsil Landi Kotal, of which 11 are for boys whereas 6 are for girls. The allocational criteria recommended by NRM is that a boy's Middle school should serve a population of 3,900 people whereas a girl's middle should serve a population of 17,000 people. By taking these statistics, both the girl's and boy's middle schools are insufficient for the current as well as a planning period.

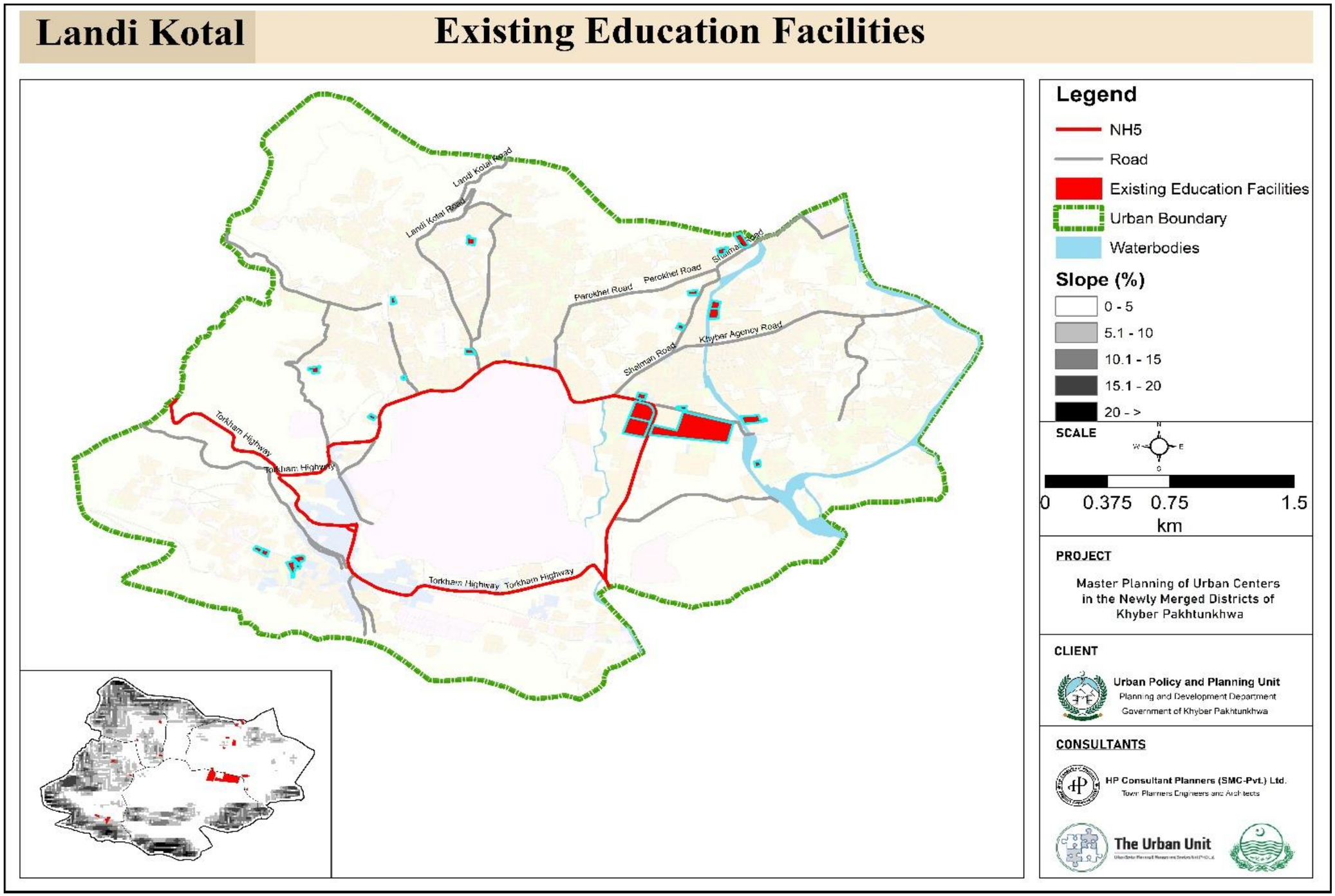
6.4.3. High schools and Higher secondary schools

There is a total of eight higher schools in Landi Kotal, of which five are for males and three for females, whereas, just one Higher secondary school is operating in the urban center of Landi Kotal.

National Reference Manual recommends a 3-4 sections High School (Classes V-X) for a population of 23,000 in case of boys, and 31,000 in case of girls. These statistics imply that higher schools for boys are sufficient for the current period. However, by 2040, at least eight schools for girls, seven higher schools for boys and five for girls

would be required. There is an only one higher secondary school is operating in the Landi Kotal. Therefore, it is proposed that at least one higher school both for boys and girls should be established immediately.

It should be noted that the standards set by the NRM during the 1980s are not compulsory to follow in current conditions and the educational needs can be updated through consultation with representatives of all sectors.



Map 18: Existing Education Facilities in Landi Kotal
Source: The Urban Unit

6.3.1. Technical and vocational centers for skills development:

A detailed inventory of technical and vocational institutes is not available for Landi Kotal urban center. However, as per the record of the local population, few yet inadequate technical and vocational centers are available.

It is therefore proposed that technical and vocational centers for skills development be established in each NC by the end of 2040. In addition to global best practices, the following table highlights NRM guidelines for optimal site location for the establishment of new facilities.

Table 6-24 : Rationale for Educational Institutions based on NRM standards

Sr. No	Educational Institutions	Locational Guidelines
1	Primary School	Near to existing and planned housing schemes areas in which they will be serving. Located at walking distance from the houses. Commonly situated centrally in a residential area and away from the busy roads. Catchment area for urban schools 055-1km. Catchment area for rural schools 2.2kms.
2	Secondary School	Must have easy and good vehicular availability and safe walking access. Away from schools of opposite gender. Far away from the main busy roads which carrying fast and heavy traffic. Must situated on roads with favourable linkages to their catchment area. Catchment area for urban schools 1.25-2.45km. Catchment area for rural schools 5-10km.
3	Intermediate Colleges	Catchment area for urban school boys 2.75-4km. Catchment area for rural school boys 10-15km. Catchment area for urban school girls 3.25-5km.
4	Degree College	Large city.
5	University	Metropolitan city area.

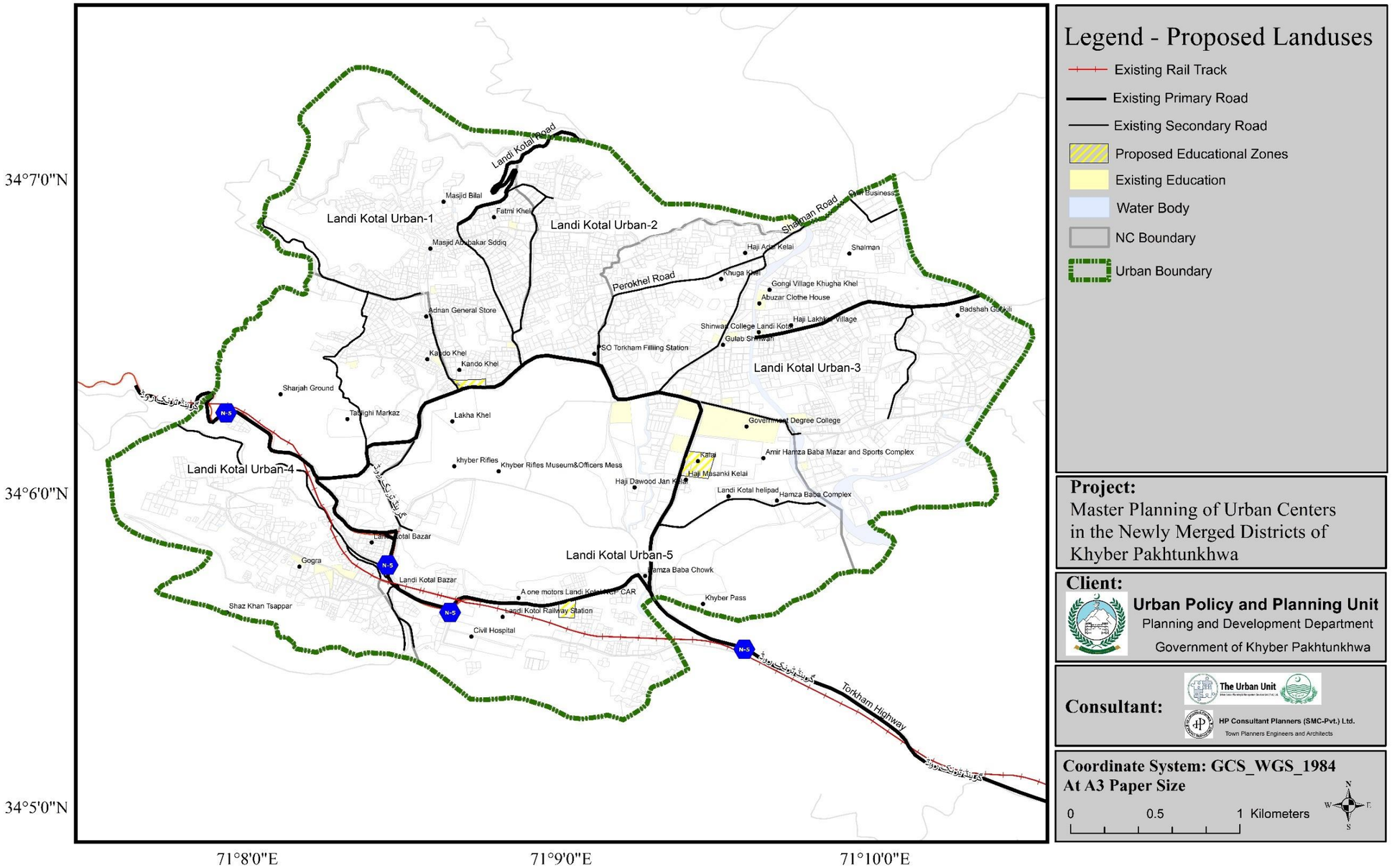
Source: National Reference Manual, 1985

6.4.4. Proposed Educational Sites

Based on the international best practices, NRM guidelines, and population growth trajectory in Landi Kotal, sites for additional schools have been identified. The following criteria have been used for site proposals:

- Based on the current need and areas, zones for educational sites have been recommended in those particular localities where the population is currently unserved.
- The future population projection for the year 2040 was the main determinant in site identification. In zones that having a population exceeding 3,000 people, a primary school is recommended, while zones with an aggregate population exceeding 20,000 have been marked suitable for establishing Elementary and Secondary [High and Higher Secondary] schools.
- Furthermore, it is ensured that educational zones, based on the future need, are proposed in residential sites – both current and future sites.

Landi Kotal Proposed Educational Zones



Legend - Proposed Landuses

- Existing Rail Track
- Existing Primary Road
- Existing Secondary Road
- Proposed Educational Zones
- Existing Education
- Water Body
- NC Boundary
- Urban Boundary

Project:
Master Planning of Urban Centers in the Newly Merged Districts of Khyber Pakhtunkhwa

Client:
Urban Policy and Planning Unit
Planning and Development Department
Government of Khyber Pakhtunkhwa

Consultant:
The Urban Unit
HP Consultant Planners (SMC-Pvt.) Ltd.
Town Planners Engineers and Architects

Coordinate System: GCS_WGS_1984
At A3 Paper Size
0 0.5 1 Kilometers

Map 19: Proposed Educational Facilities

Source: The Urban Unit

As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repeal if Building Control Authority Notify any Land Use Classification Rules applicable in KP. The development guidelines for educational facilities are below:

Table 6-25: Educational Development Guidelines

Permitted Uses	Allied Permissible Uses	Prohibited Uses
Large Scale educational areas General education universities Scientific research institutes IT and Media institutes City Level libraries, book banks, data and information centres	Staff residences (teaching and non-teaching) Separate hostels for Boys and Girls Auditoriums, seminar halls, workshop spaces, Community facilities (Parks, Playgrounds, clinics, schools and neighbourhood commercial)	Large scale commercial, industrial activities Large scale Slaughterhouses, Large scale Workshop for servicing and repairs.

Source: Urban Unit and HP Consultants

6.5. Health Facilities

Accessible, equitable, and quality healthcare for all people is the vision of the Khyber Pakhtunkhwa government. However, few health facilities are currently available in the urban centers of Landi Kotal which do not fulfill the health requirement of the people.

Issue No. 1: Access to Health Facilities

Table below shows the total number of health facilities currently available in the urban center of Landi Kotal. Give that the current population of the urban center, a total of 4 health facilities is insufficient to serve the urban population.

Table 6-26: Public Health Facilities of the Urban Area of Landi Kotal

S.No	Health Facilities	Total
1	Hospitals	2
2	MCHC	1
3	TBC	1

Source: KP Tribal Districts Health Facilities Registry

The above-stated table shows the total number of health facilities currently available in the urban center of Landi Kotal. The population of the urban center according to the census report of 2017 is 33,729 whereas the total number of health facilities available is just four which is insufficient to serve the population.

Table 6-27: Town-wise Number of Health facilities

S.no	NC	CHC	CD	Hospital	MCHC	TBC
1	Town 1	-	-	-	-	
2	Town 2	-		-	-	
3	Town 3	-	-	-	-	
4	Town 4	-	-	-	1	
5	Town 5	-	-	1	-	1
	Total					

Source: KP Tribal districts health facilities registry

The accessibility of facilities based on the HH survey data findings- is shown below

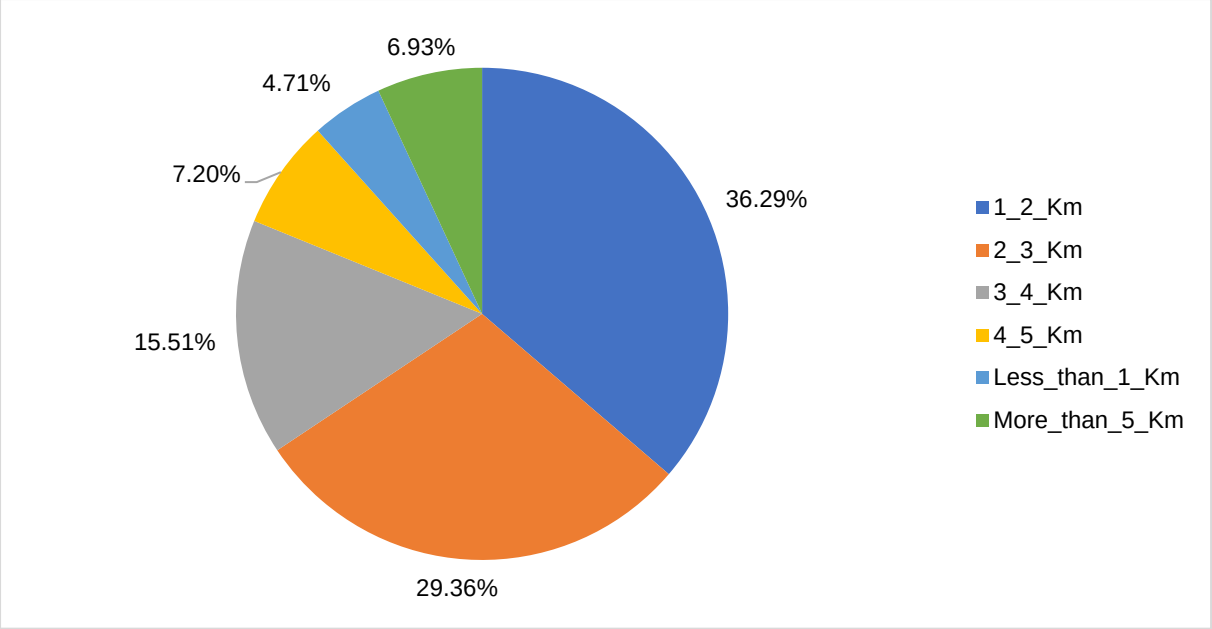


Figure 6-1: Distance to Nearest Health Facilities

Source: HH Survey Conducted by the Client (Consultant)

The household Survey Conducted revealed that Health facilities available in Landi Kotal include BHU, CHC'S, DHQ, a few small hospitals, and private clinics. 29.36% of the total sample population confirmed that health facilities are available in the range of 2-3 km from their homes. Approximately 15.51% of the total sample population reported that health facilities are available in the range of 3-4 km while almost 6.93% confirmed that health services are not available in the range of 5 km.

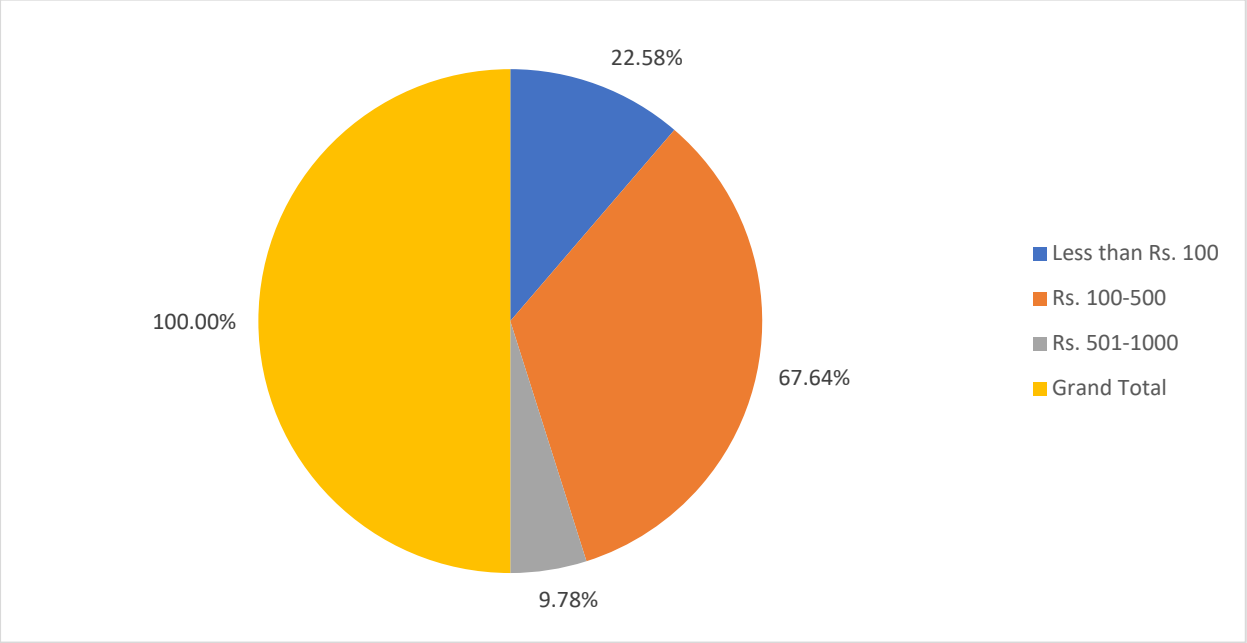


Figure 6-2: Cost per visit to a health facility

Source: HH Survey Conducted by the Client (Consultant)

The analysis of the household survey shows that 22.58% of the respondent spend less than 100 rupees on transport mode per visit to travel from home to the health facility. Almost 67.64% of the respondent confirmed that they spend in the range of 100-500 rupees per visit while 9.78% of the respondents reported that the amount in the range of 500-1000 rupees.

6.5.1. Rationale for Proposed Health Facilities

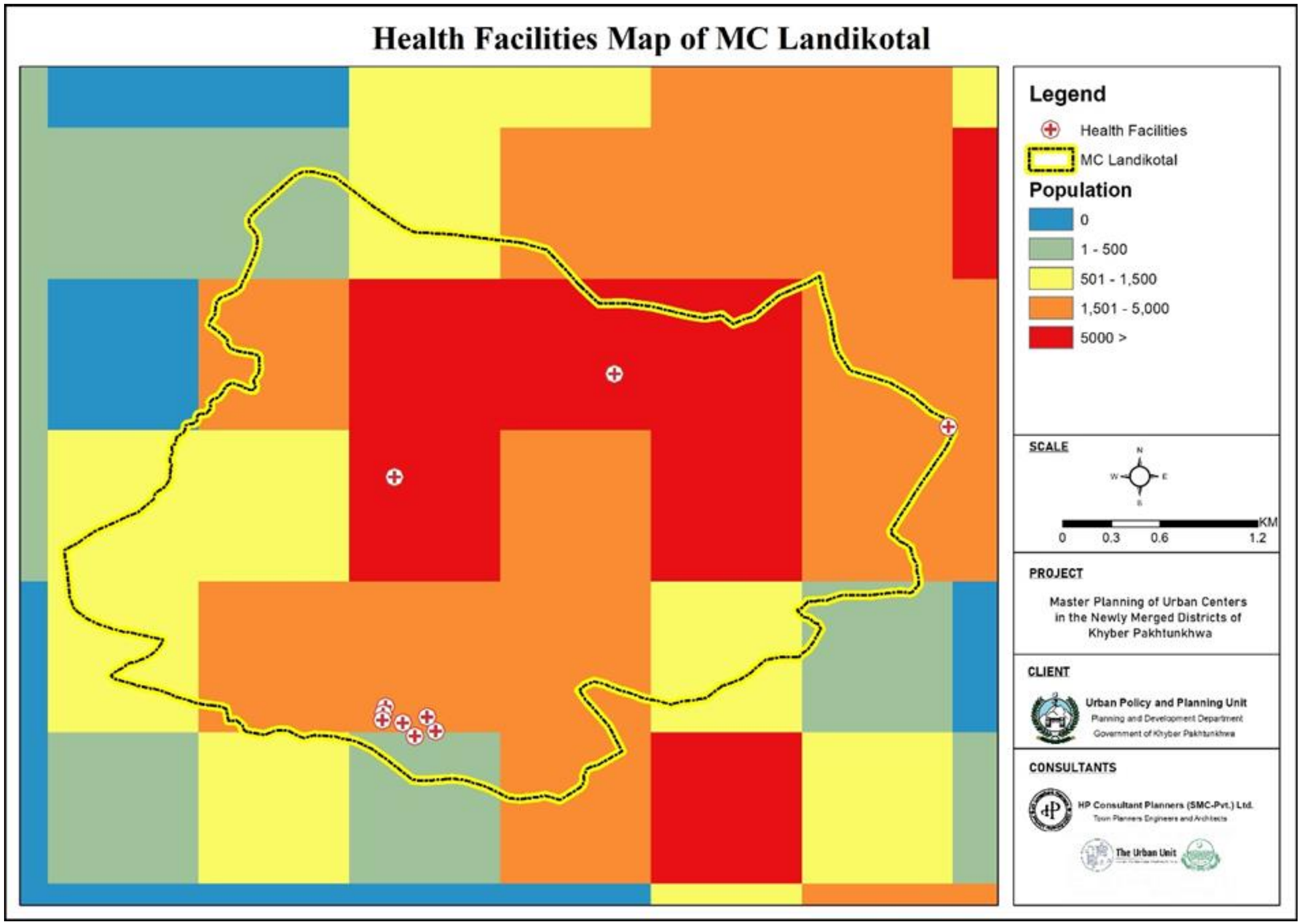
Factors considered for proposed health facilities sites are:

1. High population density areas
2. Proximity to other health facilities
3. Unserved existing and new residential areas
4. Proximity from road infrastructure

The Map below shows the distribution of health facilities, along with population densities of the region. A Hot spot analysis is done to identify the population clusters in the region and overlaying the existing health facilities on the map help to identify the unserved areas.

It can be seen that the health facilities are clustered in the south side of the region near the existing commercial area. Most of the population is lying in the center and

north of the region. Additionally, few facilities, are scattered in the north east side of Landi Kotal.



Map 20: Distribution of health facilities and population density in Landi Kotal

The NRM guidelines have been consulted for the provision of new health facilities. Obtained parameters include certain guidelines for geographical distribution and plot sizes of the health facilities.

Table 6-28: Allocation criteria of health facilities as per NRM

Sr. No.	Type	Allocation criteria	Covered/Site area
1	Basic Health Unit (BHU)	10,000	1250 – 2500 m^2
2	Dispensary (Urban)	One per large school/factory	2 rooms
3	Community Hospital / Polyclinic	-	1 hectare
4	Tehsil Hospital	One per tehsil	2 hectares
5	District Headquarter Hospital	One per district	5-8 hectares
6	General Hospital	In large cities	3-7 hectares
7	Teaching Hospital	On provincial/regional basis	20-40 hectares
8	Specialized Hospital	In metropolitan cities	55-75 m2 / bed

Source: National Reference Manual on Planning and Infrastructure Standards

In addition, the following spatial factors have been considered when selecting a suitable site for constructing a new health facility:

- **Catchment:** Health facilities should be situated in the vicinity of dense areas or population built-up which includes both residential and commercial areas[15].
- **Complimentary Land Uses:** As per the NRM guidelines, health facilities should be located on a route which is adjacent to other facilities such as other health facilities, police station, ambulance and fire services. Numerous studies on site suitability for health facilities show that health facilities should be within proximity to each other[16].

[15] Zhou & Wu (2012). GIS-Based Multi-Criteria Analysis for Hospital Site Selection in Haidian District of Beijing.
[16] Sharmin and Neema (2013). Appropriate Locations of Hospitals in Dhaka City in Bangladesh.

- **Environmental factors:** As per the NRM, the health facilities should be located in pleasant surroundings among trees and plants, and there should be minimum environmental pollution including noise and dust.

As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repeal if Building Control Authority Notify any Land Use Classification Rules applicable in KP. The development guidelines for Health facilities are below:

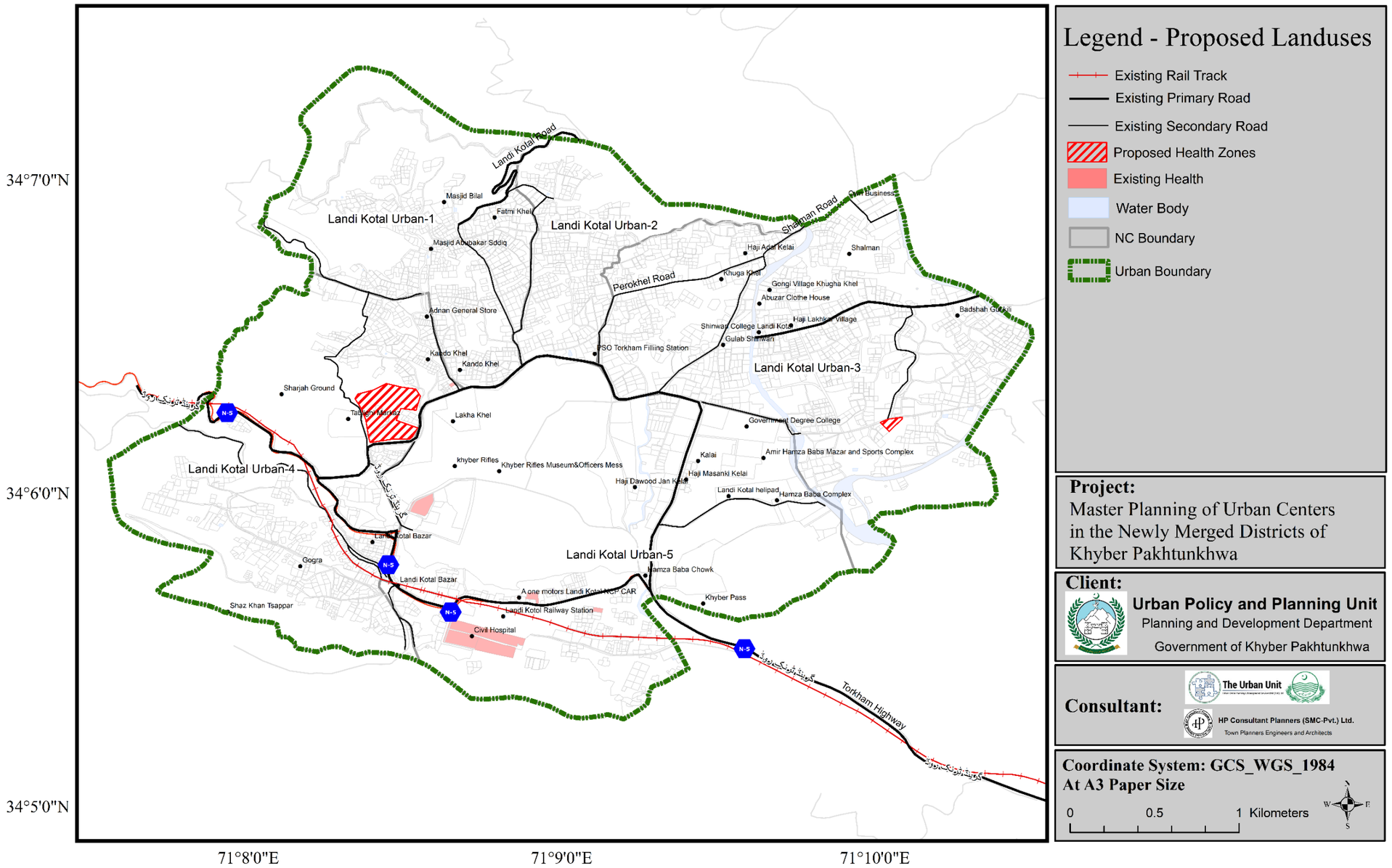
Table 6-29: Health Facilities Development Guidelines

Permitted Uses	Allied Permissible Uses	Prohibited Uses
Large Scale Health Institutions; Hospitals, **Scientific research institutes,** **Clinics,** **Clinical Laboratory,** **BHUs and RHCs,** **Maternity Care Centres.**	Staff residences, Community facilities (Parks, Playgrounds, schools and neighbourhood commercial), Banks or Automated Teller Machine (ATM), Departmental Store, Taxi or bus stand.	Large scale commercial, industrial activities Large scale Slaughterhouses, Large scale Workshop for servicing and repairs.

Source: Urban Unit and HP Consultants

The map below shows the areas identified for the construction of public or private health facilities. Mainly primary facilities are proposed to cater to the needs of population. In the long term, these facilities can be upgraded to secondary level facilities, depending on the health needs of the people in the region.

Landi Kotal Proposed Health Zones



Map 21: Proposed Health Facilities

Source: The Urban Unit

6.6. Connectivity and Accessibility

Cities of today rely on transportation systems for socio-economic sustainability. Housing patterns, land use, and commercial hubs are all influenced by the transportation system which facilitates the movement of people and goods between these areas.

Landi Kotal is classified as a Tehsil of the newly merged District Khyber and shares a boundary with Jamrud on its eastern side. The city is situated along the Grand Trunk (GT) Road, or N-5, a major trade route connecting Pakistan to Afghanistan and other Central Asian nations. Due to its proximity to the Torkham Border, Landi Kotal has developed into a bustling urban area and consequently exhibits the typical transportation issues of traffic congestion, inadequate parking space, and demand for public transit services.

This master plan describes the transportation issues of Landi Kotal and proposes a series of short-, medium-, and long-term transportation interventions for improving its road network, traffic operations, parking facilities, and transit services.

6.6.1. Mobility Issues

Landi Kotal city faces traffic congestion issues caused by encroachments of road space, on-street parking, poor pavement conditions, inadequate road geometry, lack of traffic control devices, and aggressive driver behavior.

Perceptions derived from the Household Information Survey (HIS) regarding various road conditions show that the residents of Landi Kotal are not happy with the existing road mobility scenario. The findings of the HIS survey are summarized in Figure 6-3.

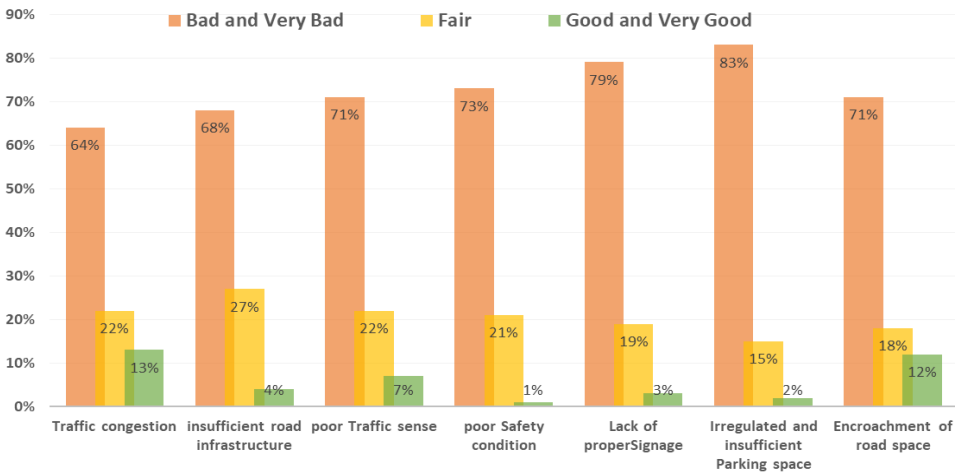


Figure 6-3: Mobility problems of Landi Kotal

6.6.1.1 Existing Public Transport Services

The HIS survey revealed that 71% of the respondents use public transport to meet their daily travelling needs **(Figure 6-4)** which largely comprised of wagons and Suzuki vans (55%), Taxi, Rickshaw or Qingqi (13%) and a combination of both (21%).

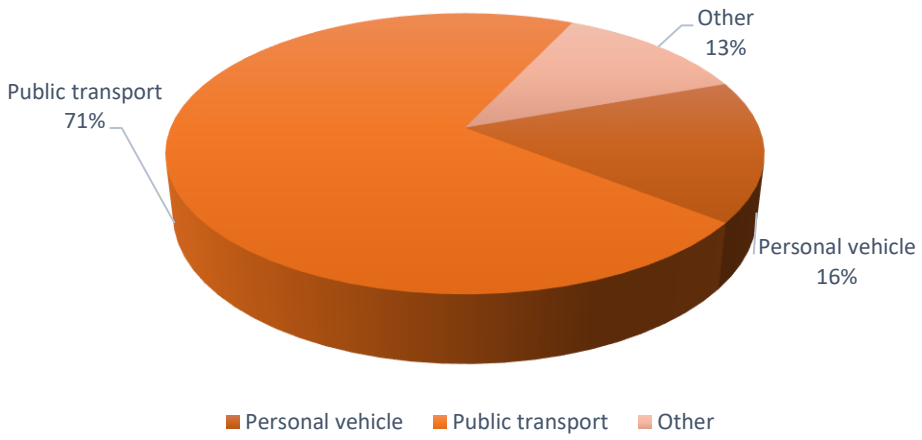


Figure 6-4: modal share of Landi Kotal

A survey was conducted to determine the perception of public transport users regarding the importance they associate to various attributes of the public transport service in the city and their degree of satisfaction. A qualitative assessment of both variables, i.e., *importance and satisfaction*, is shown in **Table 6-30** with color grading.

To determine a cumulative impact of both variables, a weighted average score method was used with the varying score pertaining to the degree of importance and satisfaction. The weights were assigned as:

- 3 (or 50%) for important and satisfied,
- 2 (or 33.33%) for Neutral in both cases and
- 1 (or 16.67%) for not important /not satisfied

The net score of both variables is shown (in descending order) against the respective attribute in the last column of **Table 6-30**.

All except 11% of the respondents consider safety of life as important and over three fifths of them are satisfied with the prevailing public transport service. The attribute is at top with maximum net score of 5.3. Secondly, network coverage of the existing public transport service is considered important by the maximum number of respondents and 69% of the respondents seem satisfied with its coverage. The

majority of respondents seem satisfied with the cost of travel. Waiting time is a concern for several respondents, which they think needs to be improved.

Table 6-30: Public Transport Perceptions

Travel Attributes	Importance			Satisfaction			Weighted average score		Net score
	Important	Neutral	Not Important	Satisfied	Neutral	Not Satisfied	Importance	Satisfaction	
Safety of Life	89%	8%	3%	62%	21%	16%	2.86	2.44	5.3
Staff Behavior	46%	23%	31%	89%	7%	5%	2.15	2.86	5.01
Cleanliness of vehicle	46%	33%	21%	75%	21%	3%	2.25	2.7	4.95
Journey Time	54%	18%	28%	75%	18%	7%	2.26	2.68	4.94
Network Coverage	67%	11%	21%	69%	8%	23%	2.44	2.46	4.9
Cost of travel	36%	23%	41%	75%	21%	3%	1.95	2.7	4.65
Waiting Time	52%	13%	34%	44%	34%	21%	2.16	2.21	4.37
Noise	21%	15%	64%	79%	20%	2%	1.57	2.79	4.36
Crowding	15%	25%	61%	59%	39%	2%	1.56	2.57	4.13

6.6.1.2 Travel Pattern and Cost

A Roadside Origin Destination (OD) Survey was carried out at four selected locations in Landi Kotal. The locations were Bypass Bazar Chowk, Tableghi Markaz Bazar Chowk, Perokhel Road and Charwazgy Chowk. The data collected from the OD survey was used to develop the following travel pattern findings:

- Most of the trips are generated from Landi Kotal Bazar (19%), Torkham (15%), Karkhano (9%), and Peshawar (7%).
- The destination for majority of the trips is Landi Kotal Bazar (39%) followed by, Torkham (17%) and Landi Kotal City (15%)
- Most of the trips are generated at Landi Kotal NC-3 (173), Landi Kotal NC-4 (54) and Landi Kotal NC-5 (25).
- Most of the travels began at home at respective NC. These home-based travels were 252.
- The destination for majority of the trips was Landi Kotal Bazar (205/71.68%) followed by Peshawar (23), Torkham (19) and Landi Kotal (15).

6.6.1.3 Encroachment

Intrusion of businesses, vendors, and street hawkers onto the Right-of-Way of the main road in Landi Kotal bazaar is one of the main causes of traffic delays and congestion. Although the main Landi Kotal Bazaar has a service road along its length, it is occupied by illegal encroachments. Pedestrian infrastructure is also affected by encroachment causing inconveniences. Measures to control encroachments causing traffic jams and peak hour congestion are therefore required along Landi Kotal's Road network.

6.6.1.4 Lack of Traffic Signs

Road signs are necessary for providing directions to traveling traffic in order to avoid mishaps and give information to travelers. The roads of Landi Kotal are deprived of basic traffic signage. All along the route of the main highway, where much of the urban population is located, one will rarely find the required traffic signs. Junctions and U-Turns are not directed through signage, and parking/no-parking areas are not indicated. Speed limit signage is also lacking.

6.6.1.5 Illegal Roadside Parking

Due to insufficient parking facilities and lack of public transport terminals, most vehicles park along the main roads. This decreases the usable cross-section of the road. Vehicles are parked on both sides of the road, especially during peak hours when both traffic volume and parking demands increase significantly. The side effects of such parking behavior include substantial delays and congestion on the road. While most of such roadside parking is illegal, absence of enforcement makes it a common practice.

6.6.2. Road Network of Landi Kotal

The road inventory survey conducted during the *situational analysis* documented the existing road network of the Landi Kotal Urban Area. Some of the prominent roads in Landi Kotal have been revisited in the following paragraphs.

6.6.2.1 National Highway (N-5)

The national highway (N-5) is one of the most important trade routes, connecting Pakistan with central Asia through Afghanistan via Torkham border. The road passes through the congested main Landi Kotal bazar.

It has a typical cross section of 50 ft and serves two-way traffic. The drivable width is often compromised due to long queues of semi-trailer trucks parked along the roadside.

6.6.2.2 Bypass Road

Owing to the traffic congestion in the main Landi Kotal bazar, a bypass was constructed to divert through-traffic around the Landi Kotal urban area. The bypass starts from Charwazgy chowk and meets the N-5 at the other end of the bazar where the traffic is directed back towards Torkham Road.

6.6.2.3 Shalman/ Perokhel Road

This is the main road which carries traffic from Landi Kotal towards the Shalman area. Much of the Landi Kotal urban area population also uses this road for transport towards the main bazar. The road also carries mild heavy traffic to and from the Shalman area.

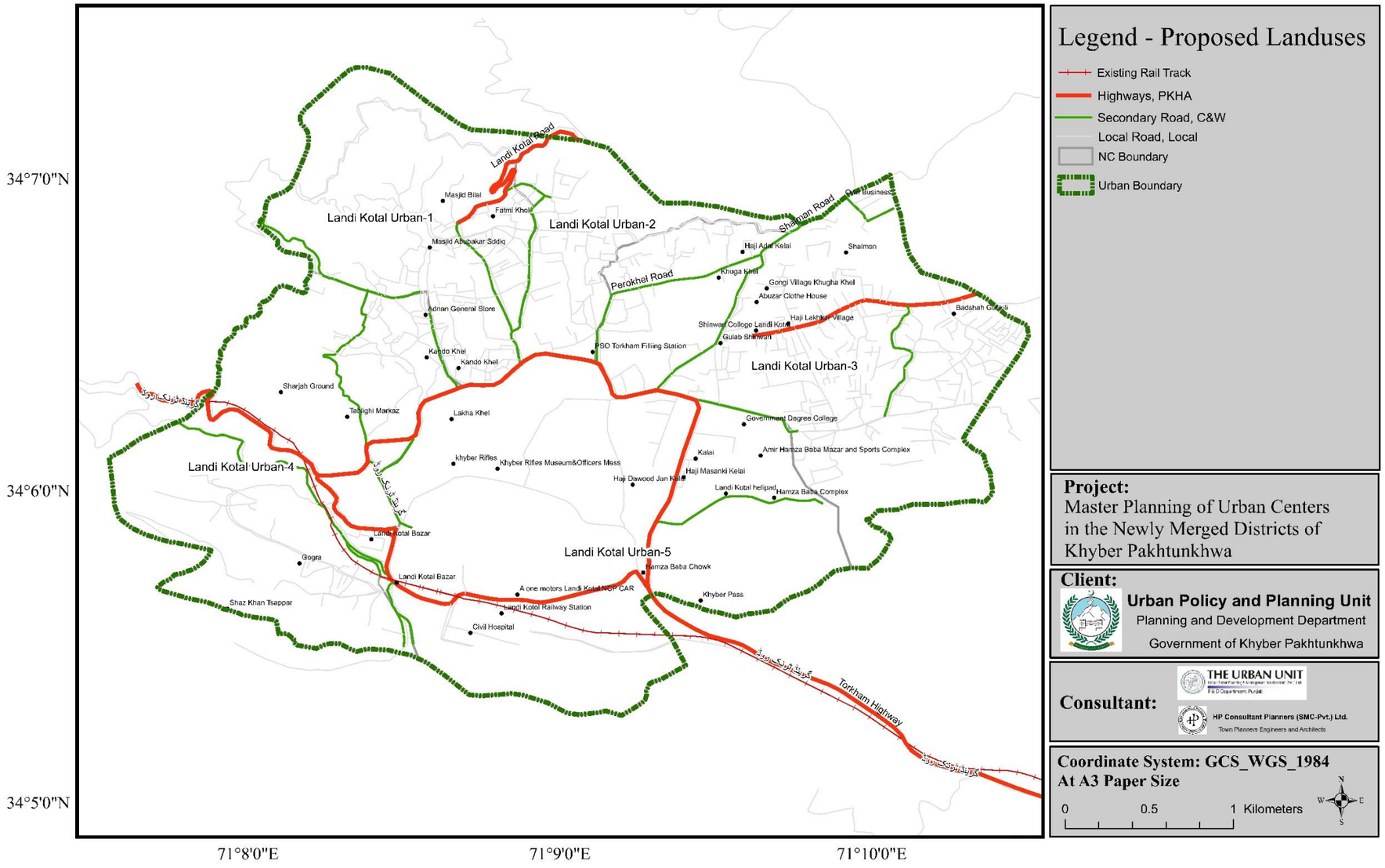
6.6.2.4 Hamza Baba Mazar Road

This road is under development and provides connectivity for the eastern part of the Land Kotal City. The road passes via a prominent shrine of a Pashto poet Hamza Baba, hence the namesake. Recently, the Communication and Works department has undertaken the construction of this road from the Landi Kotal bypass towards the Mazar of Hamza Baba.

The road network of Landi Kotal is developing irregularly without any planning. Due to the urban sprawl and increased travel demands, several transportation interventions are required for Landi Kotal. The city infrastructure also has characteristics of rural areas such as unpaved roads. The urban roads are not well-maintained and lack footpaths, drains and other allied structures. Most of these roads are single or dual lane roads and are in poor condition along many segments.

The city infrastructure also has characteristics of rural roads i.e. unpaved roads in urban areas. The road network of Landi Kotal is illustrated in Figure 1-3.

Existing Road Network of Landi Kotal



Map 22: Main Roads of Landi Kotal Urban Area

Source: The Urban Unit

6.6.3. The Khyber Pass Economic Corridor

With the anticipated rise in industrial activity in the Khyber Pass Economic Corridor (KPEC) area, the mobility issues of Landi Kotal may aggravate in the near future. The expansion of Landi Kotal and Torkham urban centers coincide with the construction of the 48-kilometer Peshawar-to-Torkham expressway by KPEC. The project, which will link Pakistan, Afghanistan, and Central Asia, is anticipated to have a significant impact on resident's quality of life and expected to create up to 100,000 new employments. The effects of economic growth will improve the social infrastructure and mobility with the increase in motorization.

6.6.4. Data Collection and Analysis

A comprehensive transportation survey plan was prepared to collect the data required to develop solutions for problems identified. For this purpose, Landi Kotal had been divided into cordons. Since Landi Kotal is a small city with a population of less than 75,000 hence two cordons were developed. The first cordon would encompass the administrative boundary of the area while the second cordon encircles the Main Bazaar area where most of the commercial activities occur. After cordon formation, points were marked where traffic studies were to be conducted. Traffic counts were conducted at each point where the cordon lines crossed a main road. Hence the points finalized for traffic counts were:

1. Landi Kotal Bazar and Bypass Junction Chowk,
2. Tableghi Markaz Bypass Chowk,
3. Perokhel Road,
4. Charwazgy Chowk,
5. Hamza Baba Mazar Road.

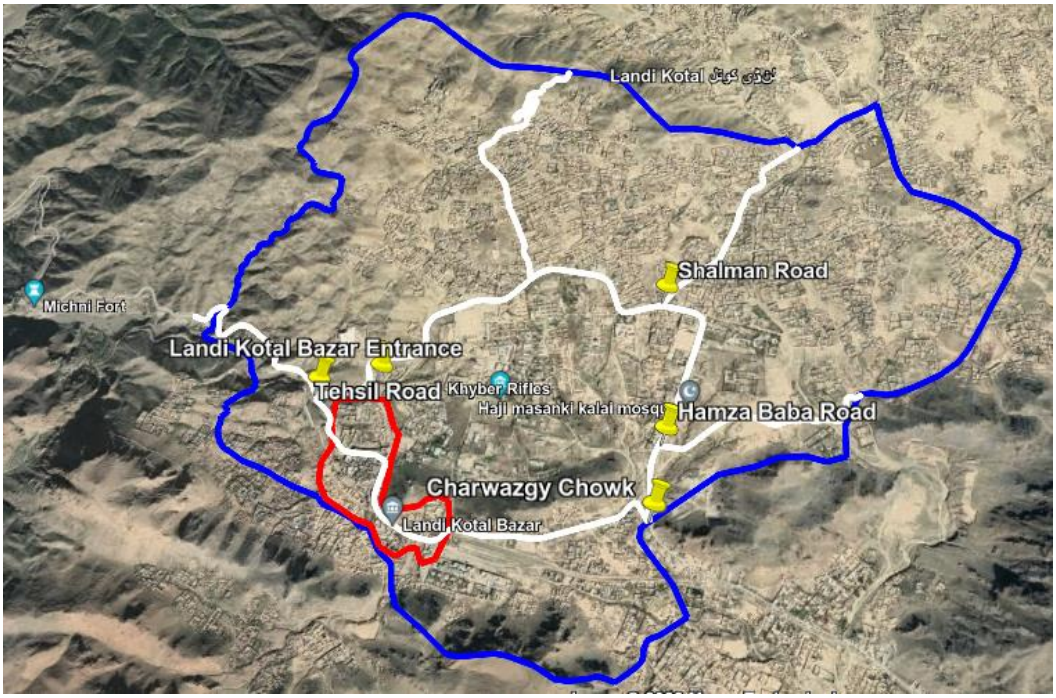


Figure 6-5 Points for Transportation Surveys

Roadside Origin Destination (OD) surveys were also conducted at the first four points as they lie on the boundary of the Urban Area and Main bazar. To evaluate public transport, interviews were conducted with public transport users. The household information survey was conducted as well as parameters i.e., socioeconomic, disaster risk and citizens behavior etc. were also inquired. On-street Parking surveys were conducted in the main bazaar while off-street parking lots were identified through field visits.

6.6.4.1 On-Street Parking

Due to lack of sufficient parking lot facilities in Landi Kotal, vehicles are parked on the Landi Kotal N-5 roads within the main bazaar area. A license plate survey was conducted for on-street parking with 30-minute intervals. The total number of vehicles parked along the main Landi Kotal road are given in the table below and shown graphically on the Bar chart as well.

Table 6-31: Vehicles Parked Per Hour

Time	Number of Vehicles Parked	Time	Number of Vehicles Parked
10:00 to 10:30	101	13:00 to 13:30	63
10:30 to 11:00	144	13:30 to 14:00	64
11:00 to 11:30	81	14:00 to 14:30	76

11:30 to 12:00	73	14:30 to 15:00	72
12:00 to 12:30	94	15:00 to 15:30	72
12:30 to 13:00	104	15:30 to 16:00	72

The vehicle parking rate on both sides of roads is approximately 100 vehicles per hour as per the survey results. Therefore, the maximum hourly on-street parking demand in Landi Kotal can be approximated to 250. Around 86% of the parked for 30 minutes or less while 7% cars are parked for 1 hour, and 2% are parked for more than 2 hours respectively (Figure 6-6).

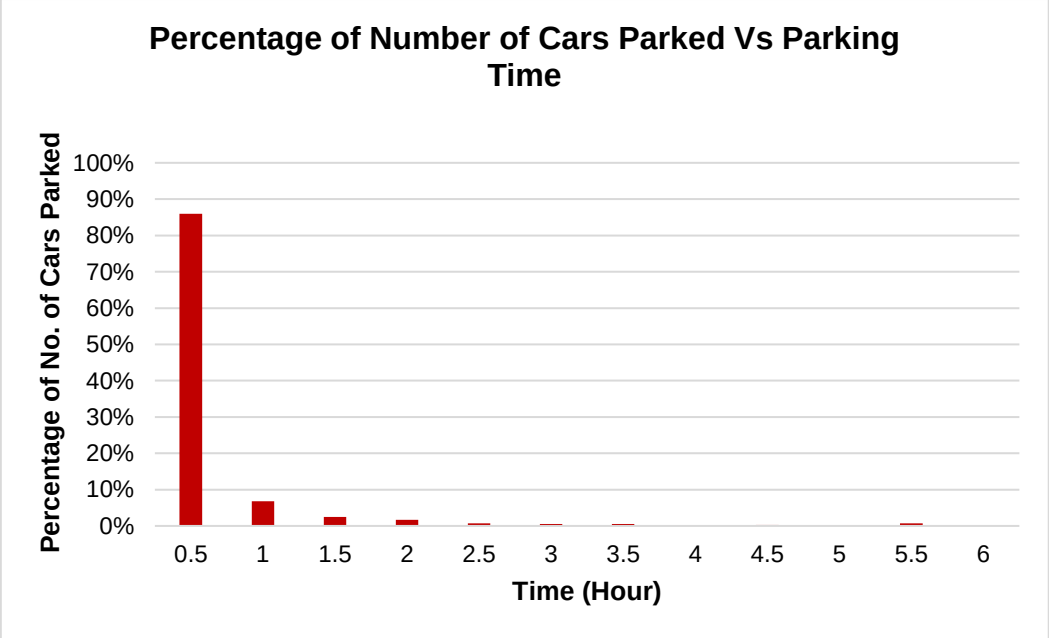


Figure 6-6: Number of Cars Parked Vs Parking Time

6.6.4.2 Parking Lot Survey

There is one private parking lot with a total area of 1.2 acres in the area near Landi Kotal Tehsil. The fee charged per car was Rs.20 /- and there is no limit for parking time. The parking lot cannot cater to all the Landi Kotal parking needs.

The survey carried out at the parking lot shows that the maximum number of vehicles parked at a time in the lot is 245. The graph (Figure 6-7) and table (Table 6-33) show the number of cars parked at different time intervals.

Table 6-32: Parked Vehicles Per Hour at the Parking Lot

Time	Number of Vehicles Parked	Time	Number of Vehicles Parked
10:00 to 10:30	140	1:00 to 1:30	188
10:30 to 11:00	151	1:30 to 2:00	196
11:00 to 11:30	171	2:00 to 2:30	223
11:30 to 12:00	188	2:30 to 3:00	245
12:00 to 12:30	176	3:00 to 3:30	172
12:30 to 1:00	176	3:30 to 4:00	154

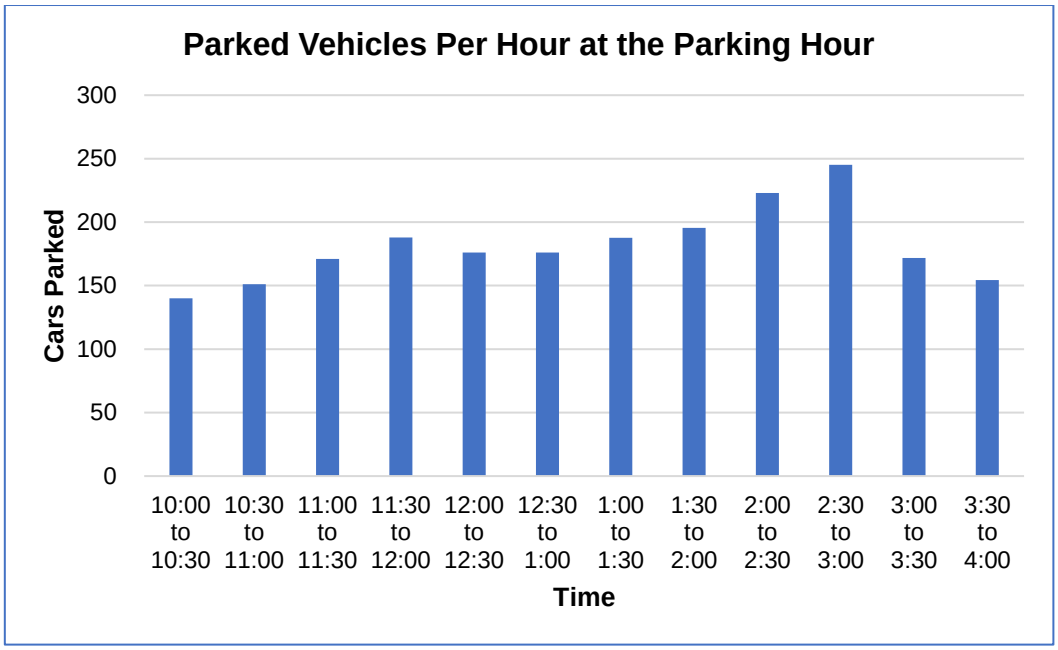


Figure 6-7 Parked Vehicles Per Hour at the Parking Lot

6.6.4.3 Traffic Signage Survey

Traffic signage is one of the most important aspects of a transportation system for safety and human life protection on the roads. Most of the Landi Kotal Urban Area is deprived of proper traffic signs. There are a few Informatory signs deployed at the main national highway N-5 marking places like Hamza Baba Mazar.

For Public Transport, such Informatory signs are also necessary for facilitating commuters. However, these signs are still not sufficient for the operation of public transport in the area. Similarly, there are no proper signs to indicate the location of

public transport stops. Public transport terminals also need to be developed and properly marked though signage.

6.6.4.4 Origin Destination Survey

OD survey is carried out to determine the flow of traffic within the city. This information is used to understand travel patterns and characteristics, measure trends for area wide transportation infrastructure needs and services; and, to monitor progress in implementing transportation policies.

Roadside interview is a common method for OD surveys, where drivers are directly interviewed at selected roadside stations to determine their travel characteristics through the study area.

Roadside OD Survey was carried out at four selected locations in Landi Kotal. The locations were Bypass Bazar Chowk, Tableghi Markaz Bazar Chowk, Perokhel Road and Charwazgy Chowk. The results of the Roadside OD survey are as follows:

The average occupancy of vehicles was 4.39.

The vehicle type interviewed consisted of 45.05% Car/Jeep, 25.78% were Wagon/Suzuki Van, 9.64% Motorcycles and 15.10% were Pickup/Hiace.

The distribution of the trips by purpose showed 7.53% of the passengers were heading towards work. 8.57% were heading towards business while 10.13% were private vehicles passengers going for personal affairs. Remaining were public transport passengers commuting for various activities.

6.6.4.5 Traffic Count Study

For the traffic count and turning movements at intersection, 5 different locations were selected. These points were located at the cordon points of the Urban Area and at the cordon points of the Landi Kotal Main Bazar. The traffic count conducted was initially for a total of 8-hours on and then a complete 12-hour count was also conducted for

further refinement. The peak hour volumes for each point (both directions) are shown in Figure 6-8. Complete traffic Count data is available in Annexures

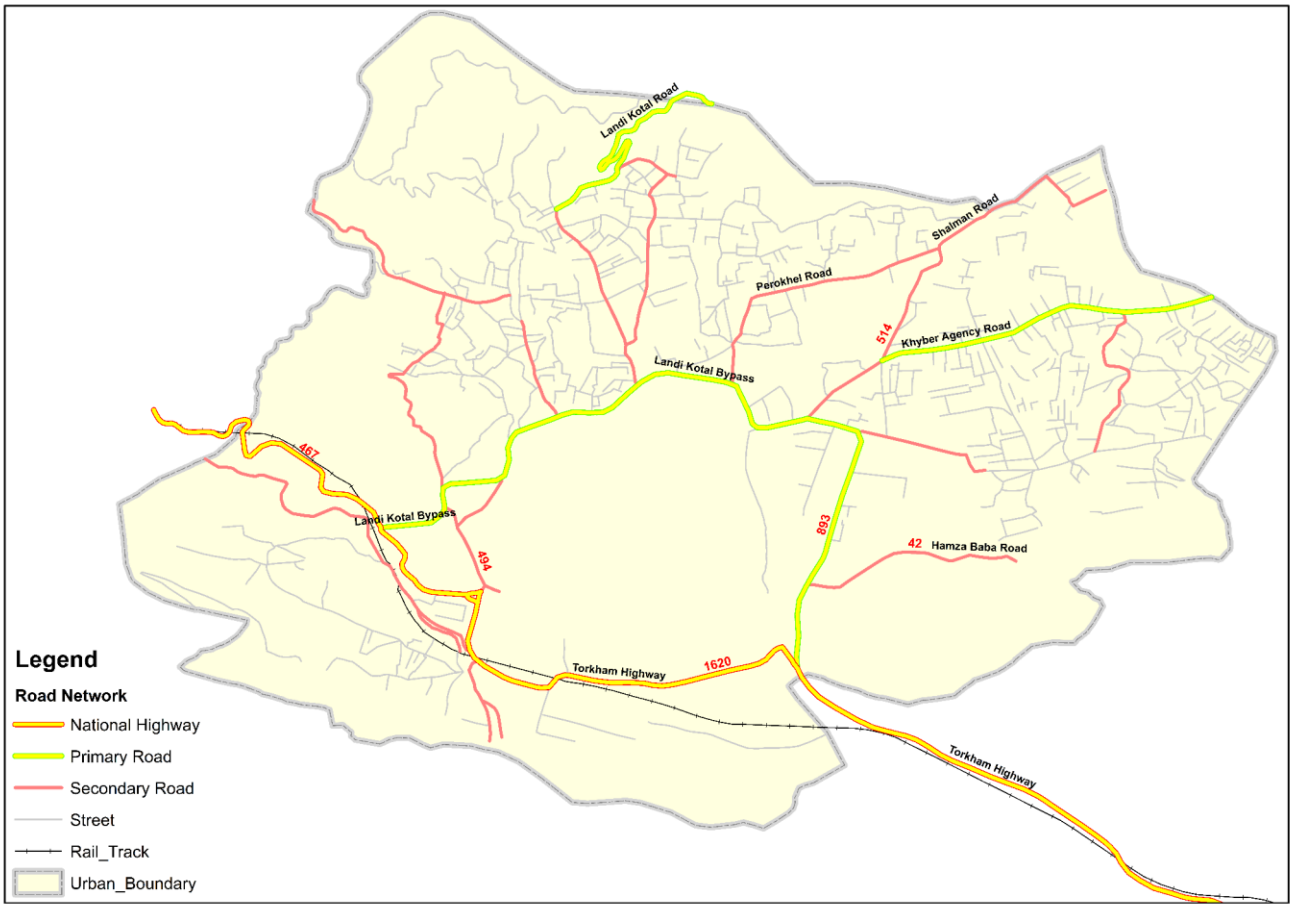


Figure 6-8: Traffic Volume Capacity/Level of Service Study (LOS)

A comprehensive study was undertaken after completing the traffic count studies in the Area. The capacity and level of service for different sections where traffic counts were carried out as per the HCM, 2010 which are given below in the table:

Table 6-33: Level of Service of different roads

Road Section	**Level of Service**
Charwazgy Road	B
N-5 Main Bazar Entry	C
Bypass near Charwazgy	B

Bazar Entry Near Torkham Road	A
Shalman Road	A
Tehsil Road near Tableghi Markaz	A

The results show that the area has partial Urban characteristics in general. Thus, such area usually has LOS varying from A to C. **Figure 6-9** illustrates the volume to capacity ratios for the aforementioned roads.

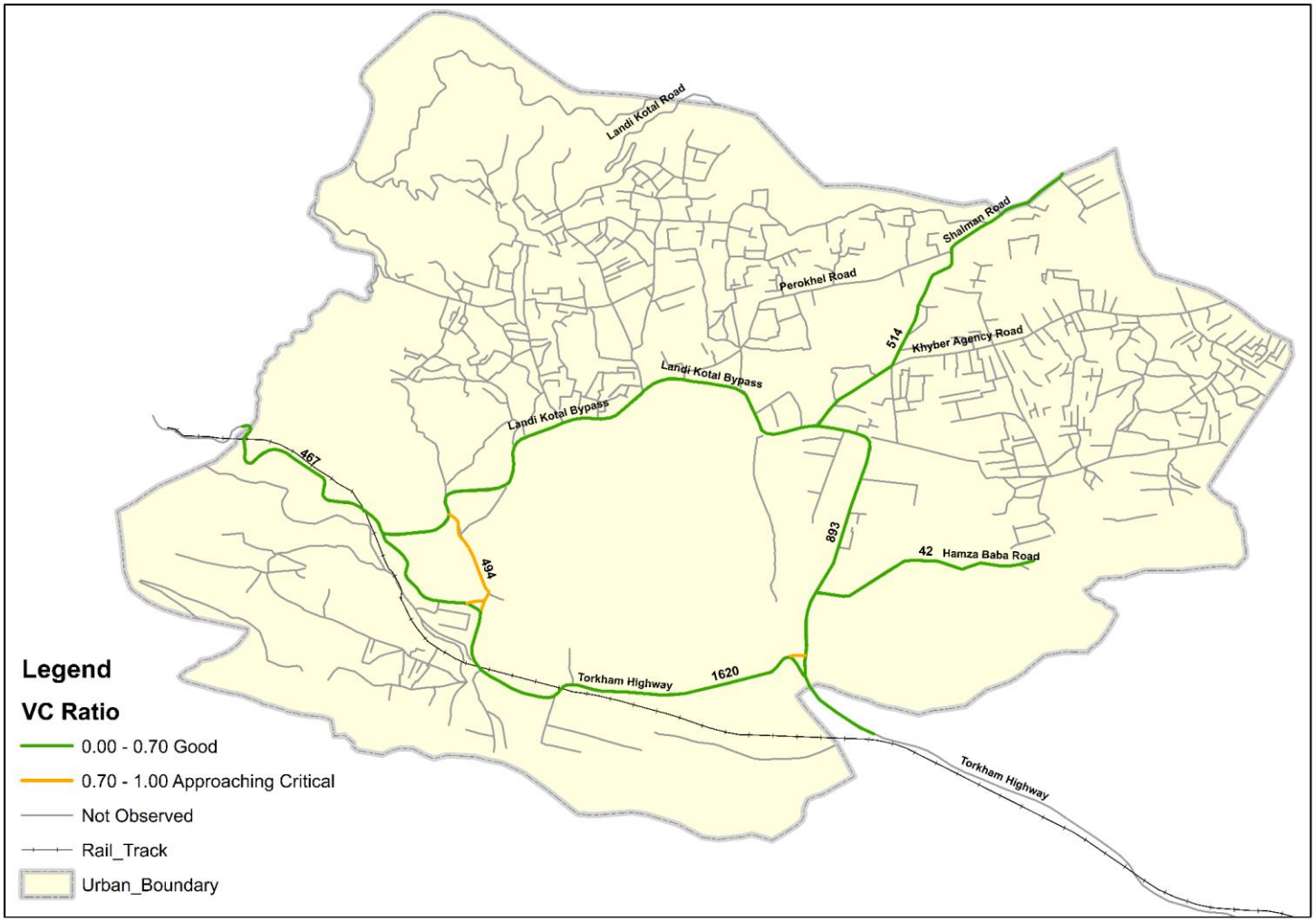


Figure 6-9: V/C Ratios of Key Road

6.6.5. Proposed Transportation Interventions

Relevant line departments such as Construction and Works (C&W), Local Government & Rural Development Department, Transport Department, and Government of KP are to implement the transportation interventions proposed herein to provide the necessary infrastructure for Landi Kotal's transportation demands.

Short-term measures are proposed to tackle the problems of relatively immediate nature that were identified during the field surveys. These should be implemented during the first five years of the plan. The Medium- and Long-term interventions proposed in this master plan are to be undertaken beyond the 5-year planning horizon, subject to successful implementation of the proposed short-term interventions.

6.6.6. Short Term Interventions

The following short-term interventions are proposed to address the road infrastructure, vehicular parking, and public transit problems of relatively immediate nature and are to be implemented within 5 years following the notification of this Master Plan.

6.6.6.1 Rehabilitation and Widening of Existing Roads

The existing road network is inadequate to cope with the mobility requirements of Landi Kotal. These issues are expected to deteriorate further with the increase in traffic. Considering other government initiatives such as the construction of an international route parallel to N-5, the city is expected to experience enhanced motorized traffic and regional expansion under the influence of these initiatives.

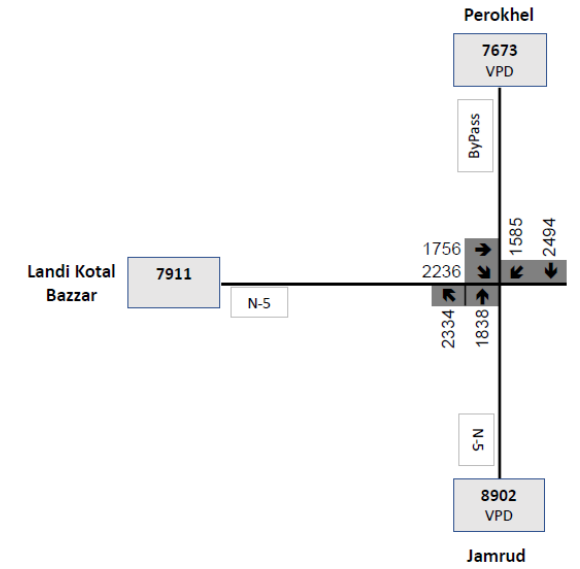
Consultation with the PKHA and C&W revealed that there is no specified threshold or criteria for undertaking road widening and improvements. Such initiatives are undertaken on an as needed basis. For the purposes of this master plan, the volume-to-capacity ratio of a given road is one determining factor for its recommended widening or dualization. A secondary reference is also used: The Widening threshold stipulated by the Planning & Development Board of Punjab of 800 vehicles per day17 (24 Hours). These criteria are applied for all those roads for which traffic volume data is available.

The traffic counts from the situational analysis were utilized to justify the proposed widening and dualizations of Landi Kotal's Road. The intersection counts and

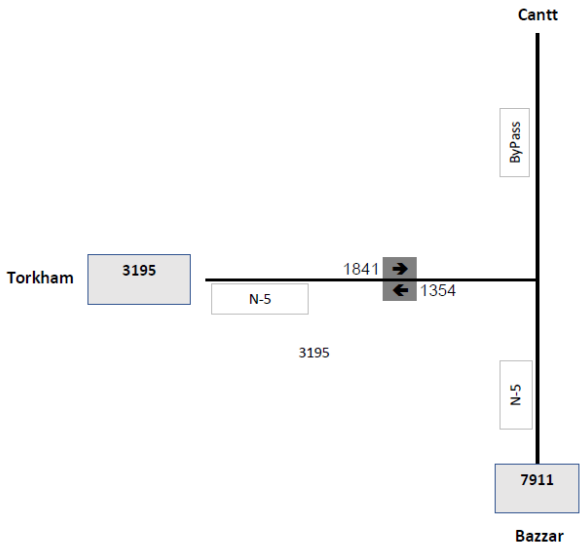
[17] Planning and Development Board Strategic Interventions for Roads https://pnd.punjab.gov.pk/system/files/Road.pdf

calculated vehicles per day (VPD) are summarized in Figure 1-9 and Figure 1-10 respectively.

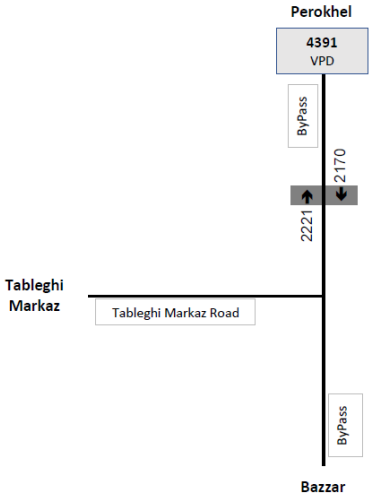
Chargwazy Chowk



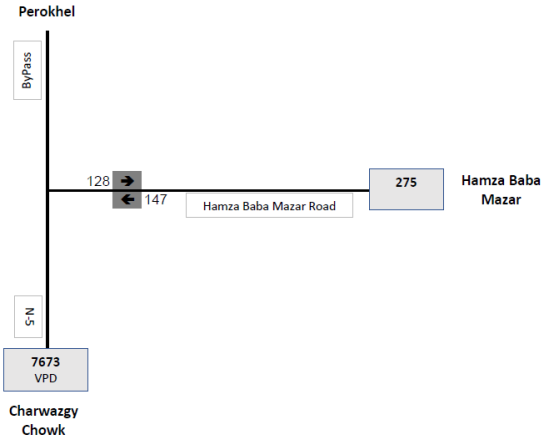
Torkham Road in Landi Kotal Bazaar



Bypass Road near Tableeqi Markaz



Hamza Baba Mazar Road



Perokhel Chowk

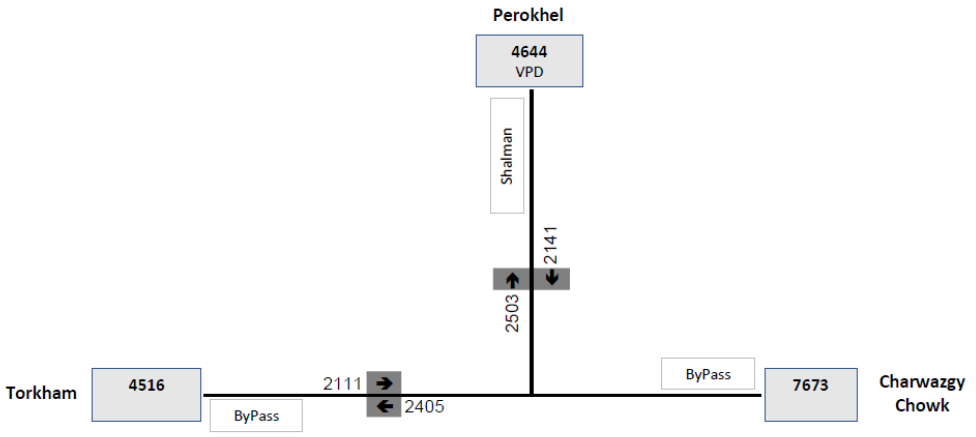


Figure 6-10: Traffic Volumes in Landi Kotal City

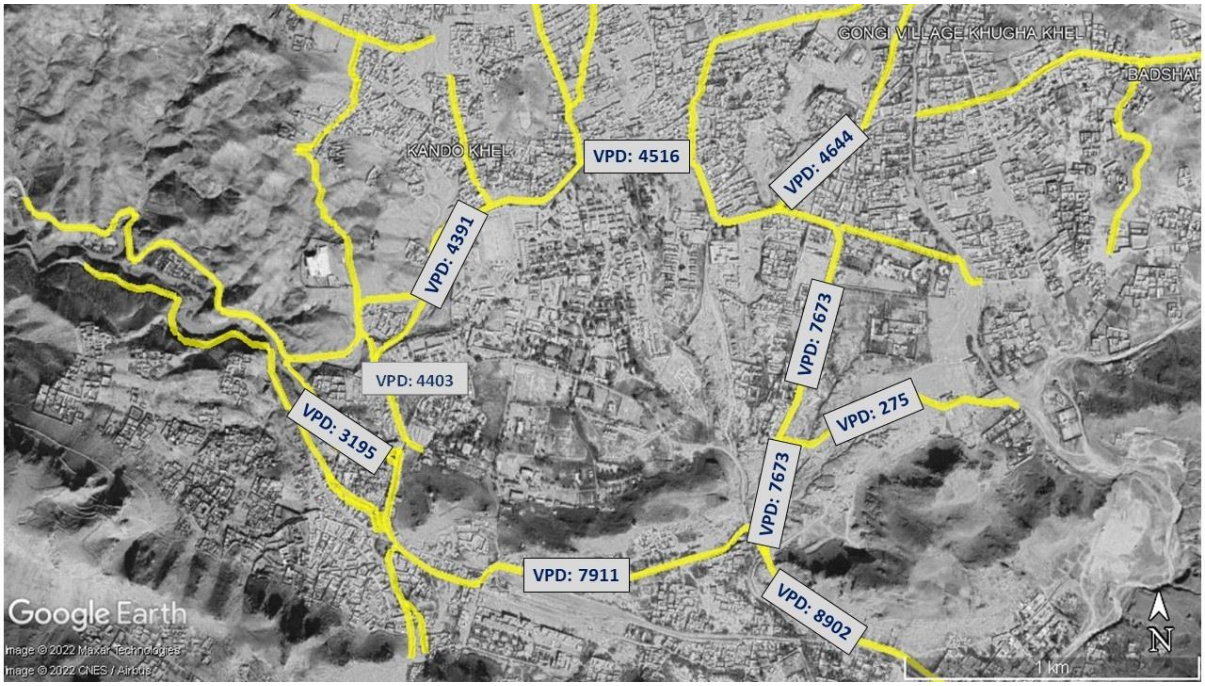


Figure 6-11: Link Volumes in Landi Kotal

Based on the traffic counts, it is proposed that the noted primary and secondary roads in the current road network of Landi Kotal city be rehabilitated and widened to 50 ft with all allied structures.

The following roads are proposed for widening in the Short-Term.

1. Shalman Road (**VPD 4644**)
2. Tehsil Road (**VPD 4403**)
3. Perokhel Road (**VPD 4644**, derived from Perokhel Chowk)

The recommended road widenings are illustrated in **Figure 1-11**.

6.6.6.2 Proposed Dualizations

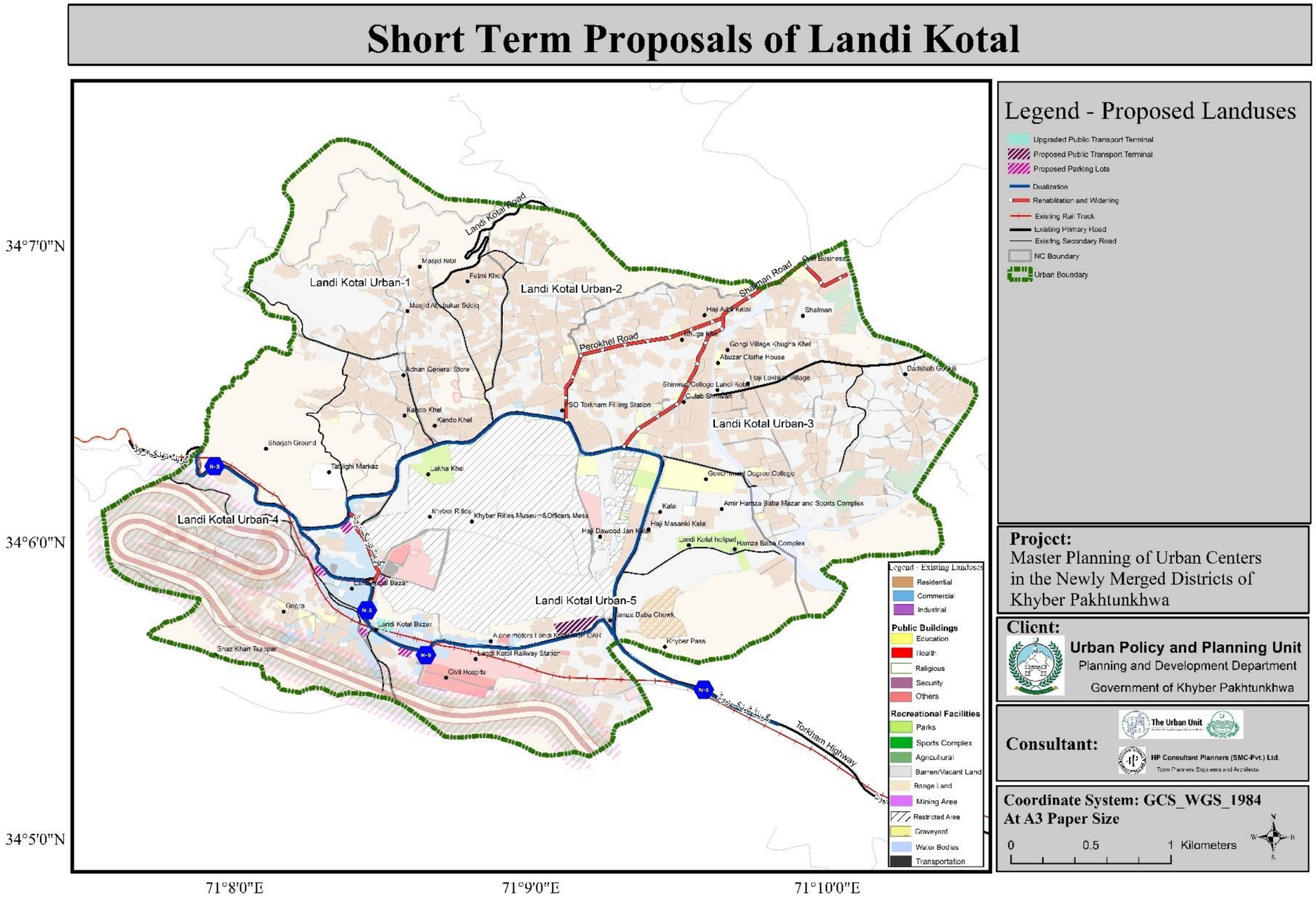
In addition to the widenings of the secondary road network, it is also proposed to dualize the Landi Kotal's primary roads to maintain the through traffic flow. These roads are recommended for dualization due to their industrial importance and the usage of semi-trailer trucks that occupy substantial driving space.

The threshold for dualization stipulated by the *Planning & Development Board of Punjab* is 8000 vehicles per day[18]. Given that the above noted VPDs are based on 12-Hour Traffic Counts, it is likely that the number of vehicles along the proposed roads exceed 8000 during a 24-Hour period. In addition, the Annual Growth rate of Landi Kotal Tehsil is 3.14%. This implies that the 12-hour Vehicular Traffic along N-5, both the Bazaar Portion, and the Bypass portion, will exceed 8000 VPD in the next 1-2 years. It is therefore proposed to undertake dualization of these roads immediately.

1. National Highway N-5 / Torkham Road, including the bypass circling Landi Kotal City (**VDP 7673**)
2. The Portion of N-5 Leading towards Landi Kotal Bazar (**VPD: 7911**)
3. Torkham Road Extending from the Western End of Landi Kotal Bazaar (**VPD: 3195**)

The proposed short term dualizations and widenings for Landi Kotal are shown in **Map 23.**

[18] Planning and Development Board Strategic Interventions for Roads https://pnd.punjab.gov.pk/system/files/Road.pdf



Map 23: Short-Term Proposals

Source: The Urban Unit

The improved road network will reduce regional disparities for suburban Village Councils. However, considering the mountainous nature of the district it is essential to initiate a detailed study to determine the best possible alignment considering all technical, economical social and environmental parameters.

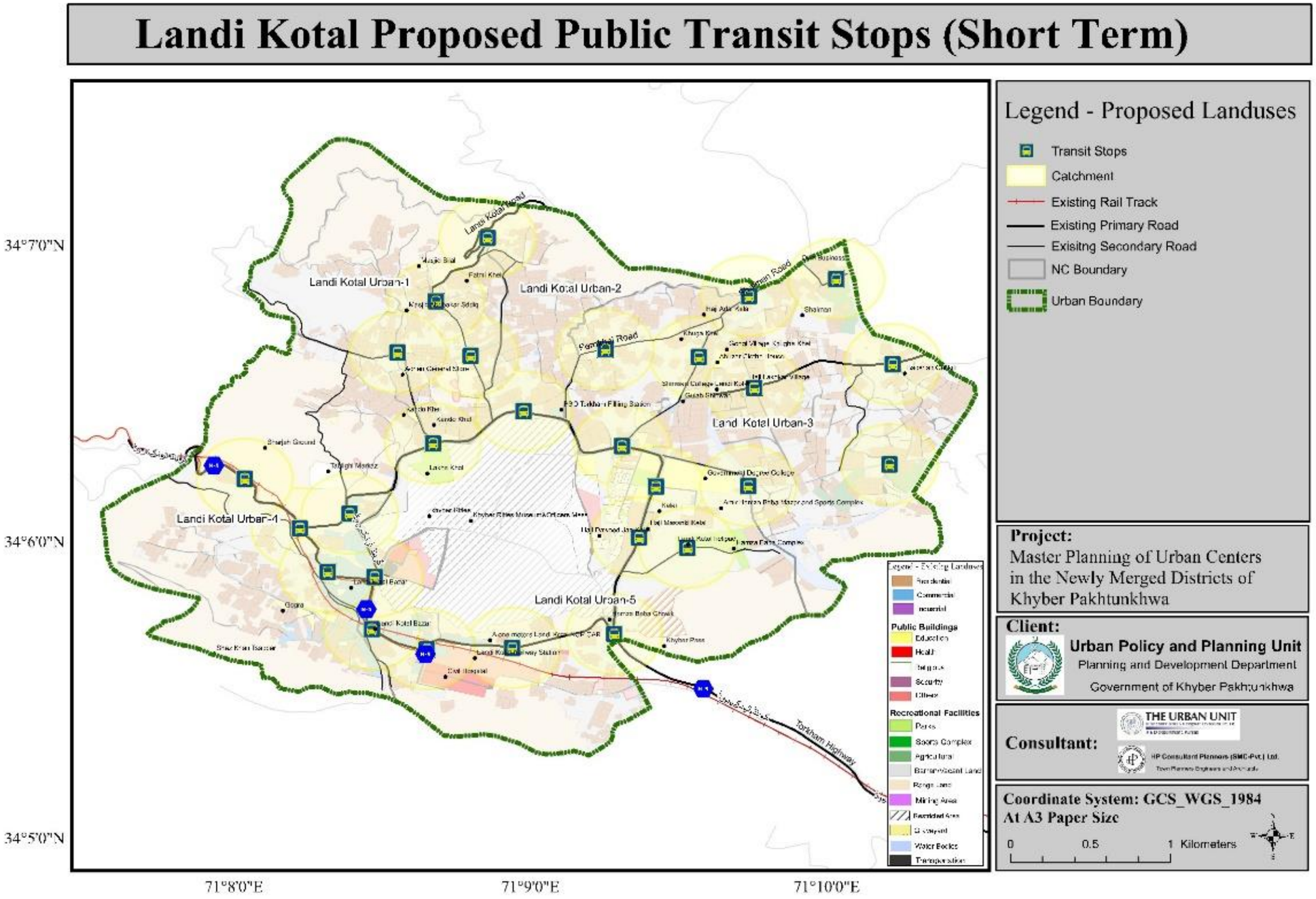
6.6.6.3 Provision of Intra-City Public Transport Services

Opportunities may be explored to provide an intra-city bus service in Landi Kotal to facilitate pedestrians and provide alternative modes of mobility. These services may be implemented using small vans.

In the short term, these services may be provided along the existing primary and secondary, local road network of Landi Kotal with services to the stops identified in the Figure 1-12. The stops have been selected such that each have a catchment (service area) of 250 meters and provide access to prominent existing localities and land uses. 250 meters is considered to be a walkable distance and accessible to a community within a 5-minute timeframe based on an average walk-speed of 1.2 meters/second.

The route planning and scheduling for these services will be determined by the relevant implementation line department.

The transit stops should be marked with signposts on the roadside. As a best practice, it is preferable to situate a transit stop on the near side (before the crossing) of the intersection.



Map 24: Proposed Short Term Public Transit Service Areas – Short Term

Source: The Urban Unit

Provision of Parking Spaces

There are no government owned parking lots in the area. One parking space has been identified in the main Landi Kotal Bazar. The lack of parking space in the area, forces the drivers to park parallelly along road side.

As per the situational analysis, it was calculated that the hourly parking demand of Landi Kotal Bazaar is approximately 250 vehicles/hour. While the average recorded dwell (parking) time was 30 minutes for each vehicle, there is also demand for long term (2+ Hours) parking.

To meet the parking needs of Landi Kotal Bazar and consequently improve its flow of traffic, five designated off-street lots have been proposed at various locations around the Landi Kotal bazaar. Given that patrons need to access different parts of the bazaar, not all 250 vehicles would park in the same location for ease of access. Therefore, the locations of the parking lots have been proposed such that the parking demand of the bazaar is distributed. The parking demands such that people visiting the Bazaar can access different parts of the commercial area on foot.

The capacities of the proposed parking lots are summarized in Table 1-5. Note that the total number of spaces is 410 to accommodate additional occasion-based parking peaks such as Jumma and Eid, and future growth. The number of spaces has been calculated at an area-rate of 325 sqft, which considers the space required for parking and vehicular circulation.

Table 6-34: Proposed Parking Lots in Landi Kotal

Lot	Area (Kanals)	No. of Spaces
1	3.6	60
2	5.3	80
3	4.4	70
4	6	100
5	6	100
Total	**25.3**	**410**

**A typical car measures 17 ft in length (10 feet for the circulation) and 6 ft in width (3 ft each side for doors). The space needed for one car to park is therefore 27x12, or 324 Sq. Ft (325 Sq. Ft Say). Example Calculation: Parking Lot – 1 (3.6 kanals): Parking Space for Lot-1 = 3.6 Kanal/325= 19602/325 = 60 vehicles.*

The proposed parking lots are shown in **Figure 1-13**.

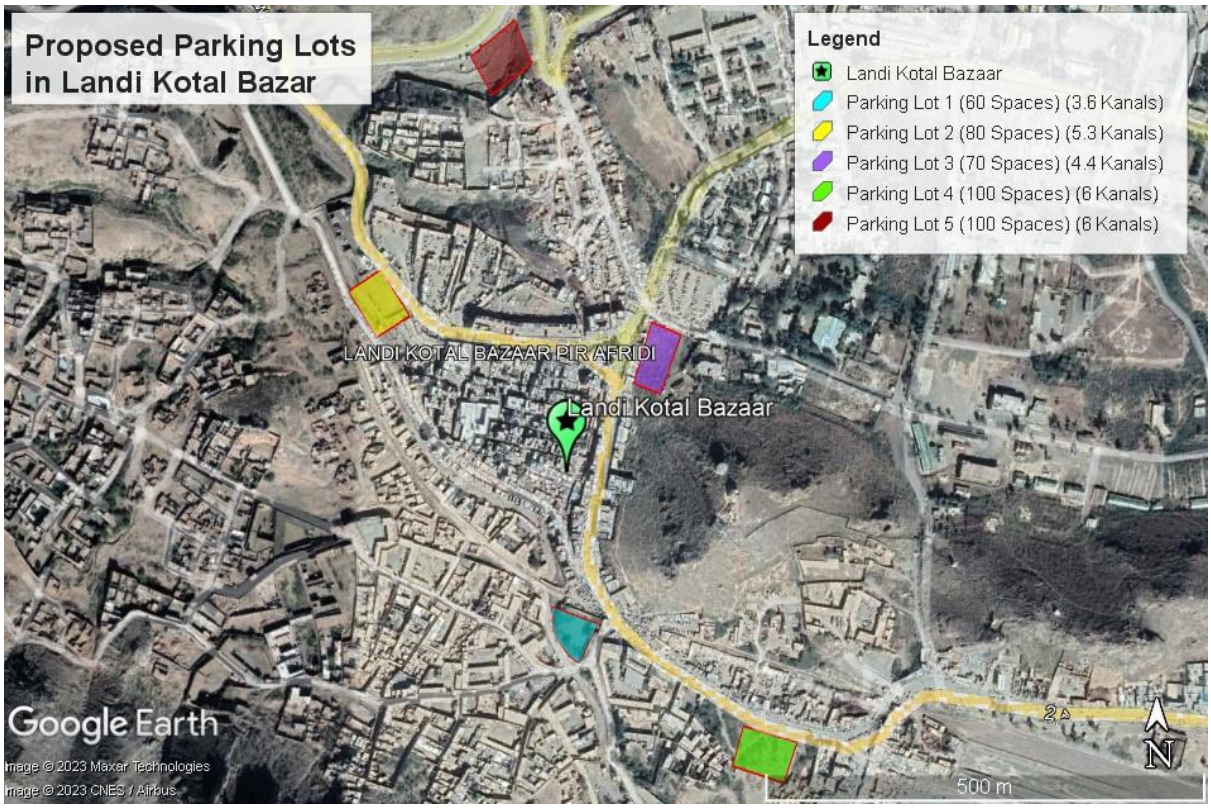


Figure 6-12: Proposed Parking Lot Locations

It is recommended that the relevant line department acquires this land and immediately utilizes it for paid off-street parking in the short term. In the medium and long term, these lots may be paved. It should also be ensured that these lots are situated along the roadside for visibility and direct vehicular access and not obscured behind commercial establishments.

Way-finding signage should be provided along the portion of N-5 in Land Kotal Bazar along with “No Parking Signage”. Examples of regulatory signage for Parking are provided in Figure 6-13.

Detailed guidelines on placement criteria, dimensions, and colors can be obtained from the Ontario Traffic Manual via this link https://stinson.ca/ontario-traffic-manual-pdf-downloads.html.

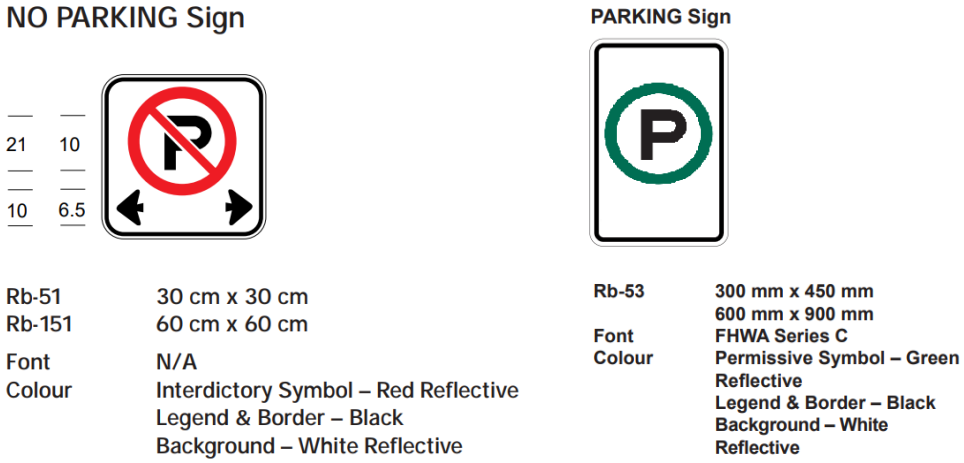


Figure 6-13: Example Parking Regulatory Signage

6.6.6.4 Formalizing Public Transport

Landi Kotal’s public transportation, like the majority of the merged areas, is composed of privately-owned vehicles such as Toyota Vitz, station wagons, and Hiace vans. These modes of transport are preferable for the people of Landi Kotal as they offer door-to-door service with privacy to families.

While this type of public transport service is effective, it is informal in nature. It is recommended that the Transportation Department begins regulating these services, following the models adopted by the Punjab Transportation Department and its subsidiaries.

Issuing of Route Permits

The Transport Department would ensure compliance to Section 44 of the Motor Vehicles Ordinance, 1965 and develop a database of these transport vehicles via

registrations19. The registration mechanism shown in Figure 6-14 has been obtained from the Punjab Transport Department and is provided as an example. The KP Transportation department operating in Landi Kotal is however encouraged to develop their own simpler, registration process that conforms to the bye laws of merged areas.

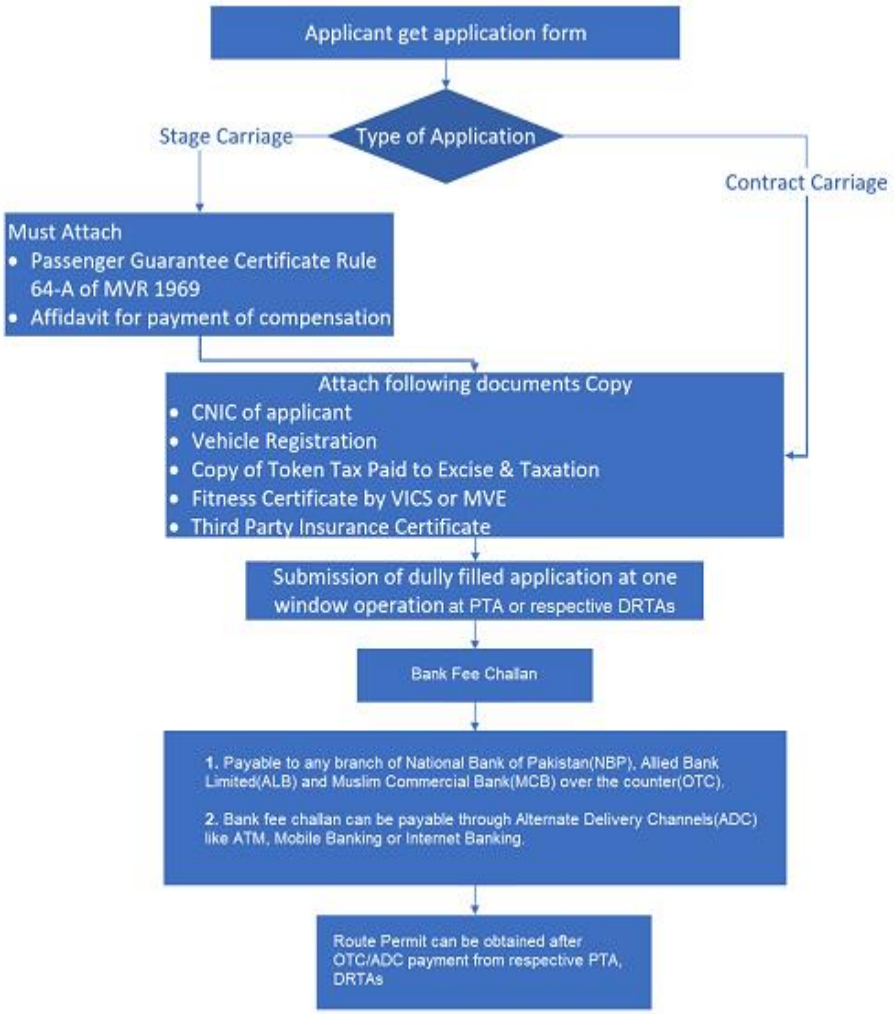


Figure 6-14: Route Permit Issuing Process (Punjab Transport Department Model)

Providing route permits to the transport operators is beneficial for the operator, regulator, and the users, in terms of ensuring safety and quality of service.

The data on transport vehicles gathered through this system will also help identify the most commercially demanded routes and allow the transport department and government to undertake other development initiatives along those routes.

[19] KP Motor Vehicle Ordinance 1965 Amended 2010 https://kpcode.kp.gov.pk/uploads/1965_19_THE_PROVINCIAL_MOTOR_VEHICLES_ORDINANCE_1965.pdf

The implementation of this system is recommended for the short-term horizon of this master plan and shall indefinitely continue to be in routine operation. A section on institutional capacity building is also provided at the end of this chapter to supplement this initiative.

Provision and Upgradation of Transport Terminals

Transportation terminals are a key element of transport systems that facilitate the layout of public transportation networks, offer passenger guidance system, and regulate the development of commercial facilities.

Currently, there are two sites being used as public transport services on an informal basis. Both locations are within the Landi Kotal Bazaar, and their locations are shown in Figure 6-15.

Figure 6-15: Existing Public Transport Services in Landi Kotal

As part of the short-term transportation plan, it is recommended to establish or designate the existing terminals in Landi Kotal as “Class C” stands to be managed by the district administration. In addition to the establishment of the route permit system described previously, the designation of these locations as transport terminals would formalize sector for both the transport operators and users.

While the existing northern terminal can maintain its size, the southern terminal is recommended to be extended to house more transit vehicles which are currently parking on the streets of Landi Kotal Bazaar.

It is also noted that the Landi Kotal Railway station is currently not operational, causing high passenger demand on public transportation services e.g., Suzuki wagons, Hiace etc. It is therefore recommended to establish a General Bus Stand of approximately 4 Acres near Ameer Hamza Baba Chowk (Chargwazy Chowk), adjacent to the existing N-5 alignment where passengers can avail inter-city transportation services.

With these interventions, Landi Kotal would have two types of formal public transportation Adda's, catering to smaller vehicles such as Suzuki, Vitz and Hiaces, and larger buses and coasters.

The proposals for Landi Kotal's public transportation services are illustrated in Figure 6-16.

Figure 6-16: Proposed Terminal in Landi Kotal

With the designation of Class C terminals, the administration can ensure that the following requisite facilities for Passengers, Terminal Staff, and Vehicle Operators can be provided and maintained:

- **Passenger areas**
  - Ticketing and queuing

- Passenger waiting areas
- Passenger conveniences (drinking water facilities and toilets)
- Passenger circulation
- Boarding/Departing areas
- Facility entry
- Tourist information
- Security, including CCTV cameras
- Retail, concessions and lease space
- Dormitories and lodging (if required)
- Cloak room

- **Areas for terminal staff**
  - Revenue office
  - Security and information
  - Ticketing booth
  - Resting room
  - Staff conveniences (drinking water facilities and toilets)
  - Canteen
  - Maintenance staff (chairs and lockers)
  - Control room (CCTV surveillance)
- **Areas for Vehicle Operators**
  - Canteen
  - Resting areas
  - Lodging areas (if required)
  - Operator conveniences (drinking water facilities and toilets)

6.6.6.5 Summary Short Term Interventions

Road Infrastructure

- Rehabilitation and Widening of Shalman Road to 50ft
- Rehabilitation and Widening of Parokhel Road to 50ft
- Rehabilitation and Widening of Tehsil Road to 50ft
- Dualization of National Highway N-5 / Torkham Road, including the bypass circling Landi Kotal City
- Dualization of The Portion of N-5 between Chargwazy Chowk and Landi Kotal Bazar

- Dualization of Torkham Road Extending from the Western End of Landi Kotal Bazar

Parking

- Establishment of Five Parking Facilities in the Vicinity of Landi Kotal Bazaar with the following spaces:
  1. * Lot 1, 3.6 Kanals in the Central Bazaar, Capacity: 60 Spaces
  2. Parking Lot 2, 5.3 Kanals along N-5 West of Landi Kotal Bazaar, Capacity: 80 Spaces
  3. Parking Lot 3, 4.4 Kanals Opposite Northern Transport Terminal, Capacity: 70 Spaces
  4. Parking Lot 4, 6 Kanals along Torkham Highway near Landi Kotal Bazaar, Capacity: 100 Spaces
  5. Parking Lot 5, 5.2 Kanals, near northern end of Landi Kotal Bazaar, Capacity: 100 Spaces

Public Transportation

- Implementation of Vehicle Route Permit Program
- Designation of Existing Transport Service Areas Terminals as Class C terminals for LTV sized vehicles (Suzuki, Vitz, Hiace).
- Upgradation of Transport Terminal 2 to House more transit vehicles.
- Construction of 4 Acre General Bus Stand Near Chargwazy Chowk for intercity Bus Services
- Reinstatement of Khyber Rail Line Operations at Landi Kotal (To be undertaken by Pakistan Railways)

6.6.7. Medium- and Long-term Interventions

Long- and medium-term measures in this Plan are those that are to be initiated during the next 5 to 20 years. These proposals are built on a comprehensive analysis of the baseline data gathered from the field or the secondary sources that has been discussed in detail in the last deliverable.

6.6.7.1 Future Travel Patterns

- The four step model has been used to predict the future travel demand of Landi Kotal.
- Trip Generation
- Trip Distribution
- Mode Choice
- Network Assignment
- The key inputs for this analysis are:
- Existing Road Network
- Existing Land Uses
- Proposed Land Use Plan

The following sections describe how the future travel demand is estimated for Landi Kotal.

Trip Generation

Major Land Uses, existing and proposed, have been used to determine trips generated by each area of the city. For this analysis, the major land uses (150,000 sqft or greater) have been defined as Traffic Analysis Zones (TAZ). These are areas that will have a substantial number of inbound and outbound trips.

The TAZs defined for Landi Kotal are illustrated in the Figure 6-17.

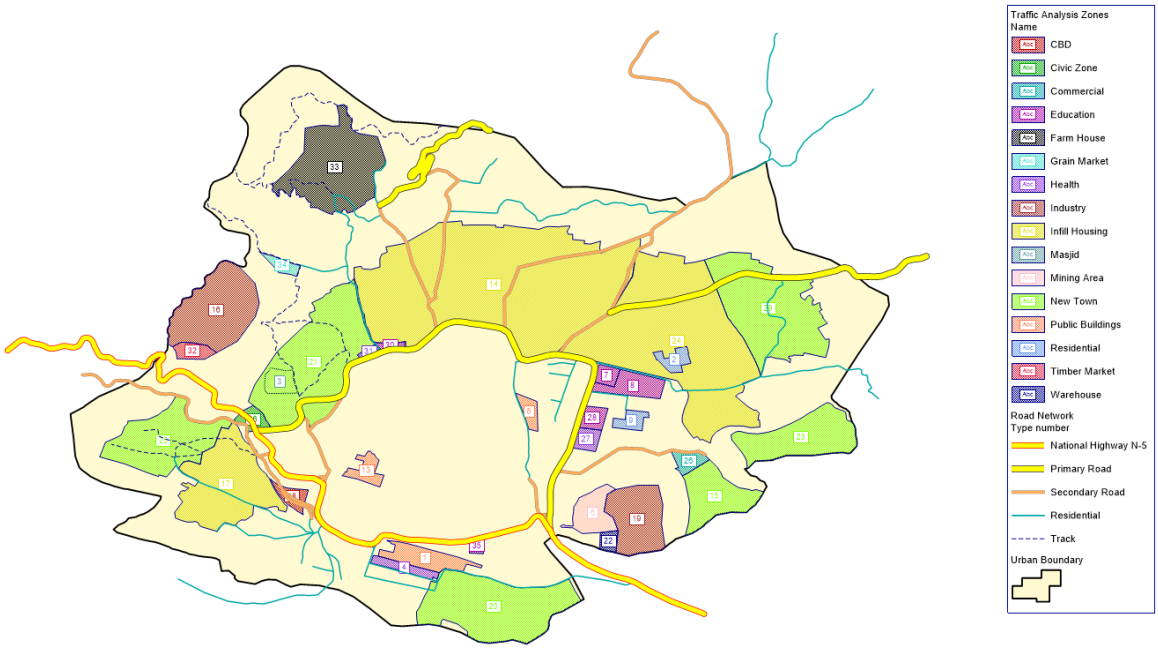


Figure 6-17: Traffic Analysis Zones

The ITE Trip Generation Manual 8th Edition has been used to estimate the peak hour trips to and from the major land uses in Landi Kotal based on the most appropriate unit and the relevant average trip rate.

The following considerations for trip generation are adopted:

- Educational facilities have not been considered as major trip generators as students are expected to commute to school via foot/ bike primarily. Moreover, proposed educational facilities are situated within neighborhoods which are expected to utilize the nearest facility. A school's traffic impact on the greater road network would therefore be negligible.
- Commercial Areas (including the proposed grains market) are approximated with the ITE Code 770 (Business Park) as the definition of Business Park includes restaurants, convenience stores, and retail. Moreover, the appropriate unit of measurement (Acres) is available in the trip generation manual.
- New Towns, Infill Zones, and Residential Zones use the ITE Code 210 (Single Detached Dwellings) for trip generation as the appropriate unit of measurement (Acres) is available in the trip generation manual.
- Industrial Zones use the ITE Code 130 (Industrial Park). The Proposed Timber Market and Mining Area also uses this code.
- Public Buildings use the ITE Code 730 (Government Office Building).

- Tablighi Markaz (Masjid) uses the ITE code 562 (Mosque).
- Health Facilities (Hospitals) are based on the ITE Code 610 (Hospital) and the covered area of their buildings.
- Civic Amenities are assumed to have 25% covered area of their total land space allocation based on measurement of existing similar facilities.

The Table 6-35 summarizes the Trip generation assumptions obtained from the ITE Trip Generation Manual.

Table 6-35: ITE Trip Generation Parameters

Zone	ITE Code	Unit	Rate	In	Out
Public Buildings	730	1000Sqft	1.21	31%	69%
Health	610	1000Sqft	1.46	47%	53%
Farm House	210	Acres	2.73	66%	34%
Warehouse	130	Acres	8.67	21%	79%
Mining Area	130	Acres	8.67	21%	79%
Residential	210	Acres	2.73	66%	34%
Commercial	770	Acres	16.84	20%	80%
Education	530	1000Sqft	2.12	31%	69%
New Town	210	Acres	2.73	66%	34%
Infill Housing	210	Acres	2.73	66%	34%
Industry	130	Acres	8.67	21%	79%
Cantonment	770	Acres	16.84	20%	80%
CBD	770	Acres	16.84	20%	80%
Civic Zone	730	1000Sqft	1.21	31%	69%
Timber Market	130	Acres	8.67	21%	79%
Grain Market	770	Acres	16.84	20%	80%
Masjid	562	1000Sqft	9.54	67%	33%

Source: ITE Trip Generation Manual

The **Table 6-36** summarizes the trip generation calculation for each land use category in Landi Kotal for the peak hour.

Table 6-36: Trip Generation

TAZID	Zone	Acres	Sq. Ft	Type	ITE Codes	ITE Units	ITE Units	Trip Rate	In%	Out%	Trips	Trips In	Trips Out
1	Public Buildings	13.4329	585138	E	730	1000Sqft	586	1.21	0.31	0.69	710	221	490
2	Residential	4.7531	207047	E	210	Acres	5	2.73	0.66	0.34	14	10	5
3	Masjid	6.2504	272267	E	562	1000Sqft	273	9.54	0.67	0.33	2605	1746	860
4	Health	5.0988	222105	E	610	1000Sqft	223	1.46	0.47	0.53	326	154	173
5	Public Buildings	4.1575	181099	E	730	1000Sqft	182	1.21	0.31	0.69	221	69	153
6	Mining Area	13.6832	596040	E	130	Acres	14	8.67	0.21	0.79	122	26	97
7	Education	3.6449	158771	E	530	1000Sqft	159	2.12	0.31	0.69	338	105	234
8	Education	11.2289	489132	E	530	1000Sqft	490	2.12	0.31	0.69	1039	323	717
9	Residential	4.4173	192416	E	210	Acres	5	2.73	0.66	0.34	14	10	5
10	Cantonment	246.7560	10748700	E	770	Acres	247	16.84	0.2	0.8	4160	832	3328
11	Cantonment	11.3707	495307	E	770	Acres	12	16.84	0.2	0.8	203	41	163
12	Cantonment	6.2509	272288	E	770	Acres	7	16.84	0.2	0.8	118	24	95
13	Public Buildings	6.1468	267754	E	730	1000Sqft	268	1.21	0.31	0.69	325	101	225
14	Infill Housing	240.3650	10470300	P	210	Acres	241	2.73	0.66	0.34	658	435	224
15	New Town	26.5654	1157190	P	210	Acres	27	2.73	0.66	0.34	74	49	26
16	Industry	48.2578	2102110	P	130	Acres	49	8.67	0.21	0.79	425	90	336
17	Infill Housing	59.6990	2600490	P	210	Acres	60	2.73	0.66	0.34	164	109	56
18	CBD	4.8115	209587	P	770	Acres	5	16.84	0.2	0.8	85	17	68
19	Industry	30.1871	1314950	P	130	Acres	31	8.67	0.21	0.79	269	57	213
20	New Town	69.7017	3036210	P	210	Acres	70	2.73	0.66	0.34	192	127	66
21	New Town	87.4582	3809680	P	210	Acres	88	2.73	0.66	0.34	241	160	82
22	Warehouse	3.0328	132109	P	130	Acres	4	8.67	0.21	0.79	35	8	28
23	New Town	38.3704	1671420	P	210	Acres	39	2.73	0.66	0.34	107	71	37
24	Infill Housing	168.4160	7336220	P	210	Acres	169	2.73	0.66	0.34	462	305	158
25	New Town	47.6318	2074840	P	210	Acres	48	2.73	0.66	0.34	132	88	45
26	Commercial	4.8630	211832	P	770	Acres	5	16.84	0.2	0.8	85	17	68
27	Health	4.8620	211788	P	610	1000Sqft	212	1.46	0.47	0.53	310	146	165
28	Education	4.9727	216612	P	530	1000Sqft	217	2.12	0.31	0.69	461	143	319
29	New Town	76.5524	3334620	P	210	Acres	77	2.73	0.66	0.34	211	140	72
30	Education	1.5031	65477	P	530	1000Sqft	66	2.12	0.31	0.69	140	44	97
31	Health	1.2704	55337	P	610	1000Sqft	56	1.46	0.47	0.53	82	39	44
32	Timber Market	4.9909	217405	P	130	Acres	5	8.67	0.21	0.79	44	10	35
33	Farm House	61.5753	2682220	P	210	Acres	62	2.73	0.66	0.34	170	113	58
34	Grain Market	3.4298	149403	P	770	Acres	4	16.84	0.2	0.8	68	14	55

35	Education	1.8716	81528	P	530	1000Sqft	82	2.12	0.31	0.69	174	54	121
36	Civic Zone	4.9854	217165	P	730	1000Sqft	218	1.21	0.31	0.69	264	82	183

The trip generation for each zone based on the above calculation is illustrated in **Figure 6-18**.

The sum value of all Trips Out for each Traffic Analysis Zone (15048) has been taken as the total number of induced vehicles in Landi Kotal's Road network.

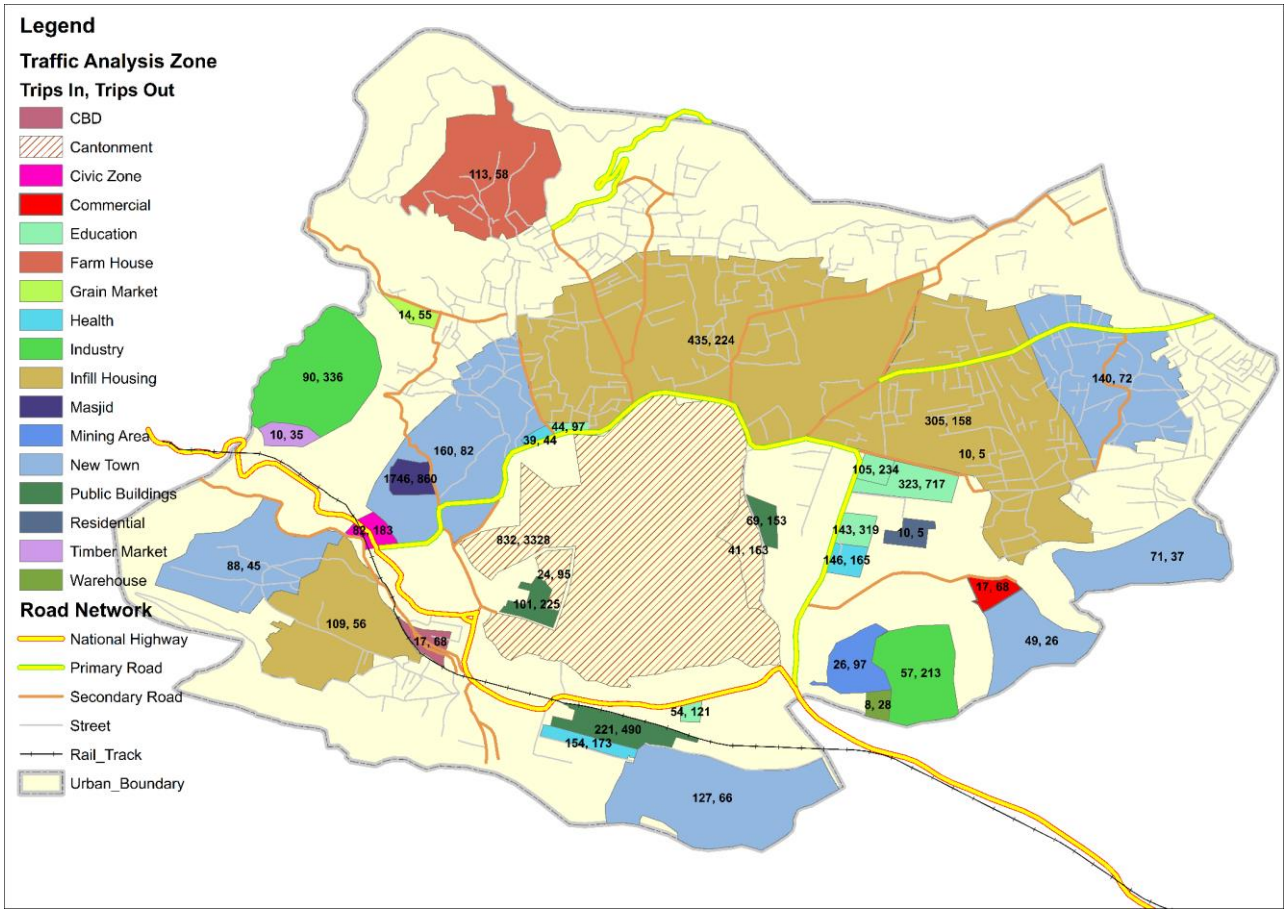


Figure 6-18: Trip Generation for Each Zone Trip Distribution

An Origin Destination Matrix analysis was carried out to estimate the interaction between the existing proposed zones based on the trip generations and attractions calculated in the previous section.

While a 36x36 matrix was prepared to represent all origin and destination zones, the following assumptions were made for more logical trip distribution:

No Intra-Zonal Trips

No trips occur between residential zones.

The sum of productions for each zone should equal to "trips out" indicated in the trip generation table.

VISSUM's trip distribution module was used to calculate the trip distribution matrix using a combined utility model and with production constraint parameters.

The result origin destination forecast matrix is shown in Table 6-37.

These trips can be assigned to the road network along the routes generated during the network assignment process in the next section to predict the traffic loads on Landi Kotal's Road network.

Table 6-37: Origin Destination Forecast

TAZ ID	Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
1	Public Buildings	0	1	137	2	7	2	10	30	1	72	4	2	7	43	5	9	10	1	5	3	13	1	7	31	8	2	12	13	15	4	3	1	11	1	1	6
2	Residential	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Masjid	36	2	0	24	13	4	19	62	2	101	8	3	9	77	10	14	20	2	11	22	14	1	15	60	14	3	27	27	30	4	4	3	21	2	9	5
4	Health	1	0	47	0	2	1	3	11	0	26	1	1	2	16	2	3	4	0	2	1	5	0	3	11	3	1	4	5	5	1	1	0	4	0	1	2
5	Public Buildings	7	0	50	5	0	1	1	5	0	23	0	1	3	10	1	3	4	0	2	4	4	0	2	7	3	0	1	2	4	1	1	0	3	0	2	2
6	Mining Area	4	0	30	2	1	0	1	5	0	11	1	0	2	8	1	2	2	0	1	2	3	0	1	6	2	0	1	2	3	1	1	0	2	0	1	1
7	Education	11	0	80	7	1	1	0	1	0	36	1	1	5	14	2	5	6	1	2	6	7	0	3	9	5	1	4	2	5	2	1	1	6	1	3	4
8	Education	31	0	240	21	5	3	1	0	0	106	4	3	14	46	6	14	17	2	7	18	21	1	8	31	13	2	13	3	15	5	5	2	16	2	8	11
9	Residential	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	Cantonment	150	7	787	100	49	12	68	211	7	0	30	13	51	297	35	63	81	9	37	89	67	4	56	219	62	12	81	91	108	19	17	10	80	9	38	41
11	Cantonment	7	0	52	5	0	1	2	6	0	24	0	1	3	11	1	3	4	1	2	4	5	0	2	7	3	0	1	3	4	1	1	0	4	0	2	3
12	Cantonment	4	0	19	2	1	0	2	7	0	13	1	0	1	9	1	2	2	0	1	2	2	0	2	7	2	0	3	3	3	1	1	0	2	0	1	1
13	Public Buildings	8	1	42	5	4	1	5	16	1	30	2	0	0	21	3	4	5	0	3	5	5	0	4	16	4	1	6	7	8	1	1	1	6	1	2	2
14	Infill Housing	10	0	67	7	2	1	3	10	0	33	1	1	4	0	0	4	0	1	3	0	0	0	0	0	0	1	5	5	0	1	1	1	4	1	2	3
15	New Town	1	0	8	1	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
16	Industry	14	1	80	9	5	2	7	21	1	47	3	1	5	27	3	0	7	1	4	8	8	1	5	20	5	1	9	9	10	2	2	1	7	1	3	4
17	Infill Housing	2	0	15	1	1	0	1	3	0	8	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	1	1
18	CBD	2	0	14	1	1	0	2	5	0	9	1	0	0	6	1	1	1	0	1	2	1	0	1	5	1	0	2	2	2	0	0	0	2	0	1	0
19	Industry	7	0	65	5	3	1	3	11	0	27	2	1	4	17	1	4	4	1	0	5	6	0	3	12	3	0	4	5	6	2	1	1	5	1	2	3
20	New Town	1	0	19	1	1	0	1	4	0	10	1	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	2	2	0	0	0	0	2	0	0	1
21	New Town	4	0	16	3	1	0	2	6	0	9	1	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	3	3	0	0	0	0	2	0	1	1
22	Warehouse	1	0	9	1	0	0	0	1	0	3	0	0	0	2	0	1	1	0	0	1	1	0	0	2	0	0	0	1	1	0	0	0	1	0	0	0
23	New Town	1	0	12	1	0	0	0	1	0	5	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	1
24	Infill Housing	7	0	50	5	1	1	2	7	0	23	1	1	3	0	0	3	0	1	2	0	0	0	0	0	0	0	3	3	0	1	1	0	3	0	2	2
25	New Town	2	0	12	1	1	0	1	3	0	6	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0
26	Commercial	2	0	21	2	1	0	1	3	0	9	0	0	1	5	0	1	1	0	0	2	2	0	1	4	1	0	1	1	2	1	0	0	1	0	1	1
27	Health	6	0	54	4	0	0	2	7	0	21	0	1	3	12	1	3	4	0	1	4	5	0	2	8	3	0	0	3	4	1	1	0	4	0	2	2
28	Education	14	0	108	9	3	1	1	3	0	46	2	1	6	21	3	6	8	1	3	8	9	0	4	14	6	1	5	0	8	2	2	1	7	1	3	5
29	New Town	3	0	23	2	1	0	1	3	0	11	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	2	2	0	1	0	0	2	0	1	1
30	Education	5	0	21	3	1	1	2	6	0	12	1	0	1	7	1	2	3	0	1	3	1	0	2	6	2	0	3	3	3	0	0	0	2	0	1	1
31	Health	2	0	9	1	1	0	1	3	0	5	0	0	1	3	1	1	1	0	1	1	0	0	1	3	1	0	1	1	1	0	0	0	1	0	1	1
32	Timber Market	1	0	10	1	0	0	1	2	0	5	0	0	1	3	0	1	1	0	0	1	1	0	0	2	1	0	1	1	1	0	0	0	1	0	0	0
33	Farm House	2	0	16	2	1	0	1	3	0	8	0	0	1	4	1	1	1	0	1	1	1	0	1	3	1	0	2	1	2	0	0	0	0	0	1	1
34	Grain Market	2	0	15	2	1	0	1	3	0	7	0	0	1	4	1	1	1	0	1	1	1	0	1	3	1	0	1	1	2	0	0	0	1	0	1	1
35	Education	1	0	35	1	2	0	2	7	0	18	1	0	2	11	1	2	3	0	1	1	3	0	2	8	2	0	3	3	4	1	1	0	3	0	0	2
36	Civic Zone	8	0	25	5	3	1	5	14	0	26	2	0	2	18	2	3	4	0	2	5	4	0	4	14	3	1	6	6	7	1	1	1	5	1	2	0

Mode Choice

It is assumed that the primary mode of travel in Landi Kotal is private Vehicle (Car).

Network Assignment

VISSUM's Private Transport Assignment Procedure was used to assign the trips occurring between zones along the existing road network of Landi Kotal with the primary factor of impedance being total Travel Time (Based on Road Class and Speed).

An equilibrium assignment method was used to assign vehicles to different roads such that average delay or impedance is relatively equal for all road users.

The network assignment results show that the Torkham Highway, Landi Kotal Bypass, Shalman Road, Tehsil Road and different unnamed road on the Western side will be the most utilized roadway during the peak hour due to the presence of Industrial and Residential and commercial Land Uses along its corridor. These 1 to 2-lane cross sections would however be able to accommodate traffic with a maximum V/C Ratio of 0.77 to 1.48.

Roads on the Eastern and Southern side of Landi Kotal will also face capacity and congestion issues where there is a significant presence of Education, Health, Public Buildings, and Residential Areas.

Roads on the Eastern and Southern side will be subject to volume to capacity ratios of 1.07 and 1.48 respectively in the vicinity of the CBD.

Table 6-38: Future Volume to Capacity Ratios of Key Roads

Name	LENGTH	NUM of LANES	CAPPRT	V0PRT	Peak Hour Volume	V/C Ratio
DHQ Hospital to N-5	0.6 km	1	400	50km/h	592	1.48
Faizan e Madina Mosque to Landi Kotal Bypass	1.1 km	1	400	50km/h	427	1.07
Hamza Baba chowk to Landi Kotal Bypass	1.07 km	1	800	60km/h	821	1.03
Haji Rasheed Mosque to Landi Kotal Bypass	0.5 km	1	400	50km/h	400	1
N-5 to Western side (residential zone)	0.5 km	1	200	30km/h	175	0.88
Landi Kotal Bypass to Fahem Khel	1.0 km	1	400	50km/h	330	0.83
N-5 to Paramedics hostel DHQ Hospital	1.0 km	1	400	50km/h	319	0.8
DHQ Hospital Road	0.4 km	1	400	50km/h	307	0.77

** Capacity of each road is assumed based on HCM 2010 formula 1800*(N-1+P_S) and further reduced by 25-50% to account for congestion and road class.*

***Based on Traffic Count Data*

****Based on trip generation, distribution, and route assignment*

*****Existing Peak hour volume + Induced Volume*

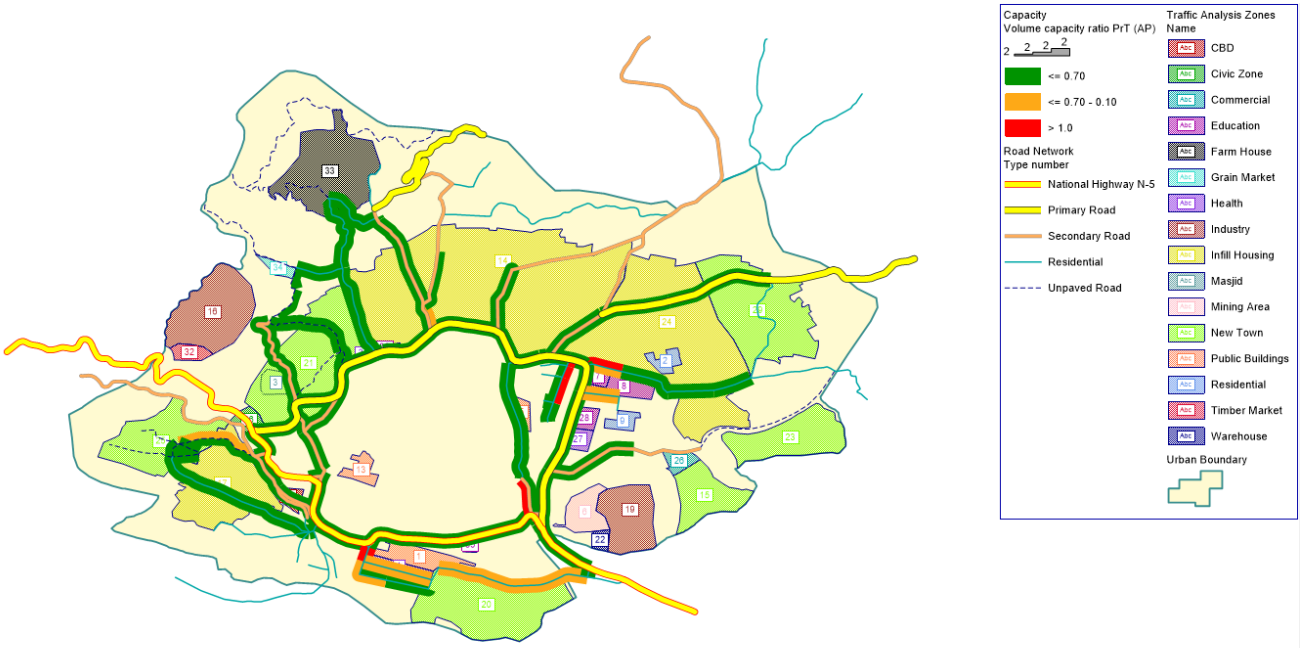
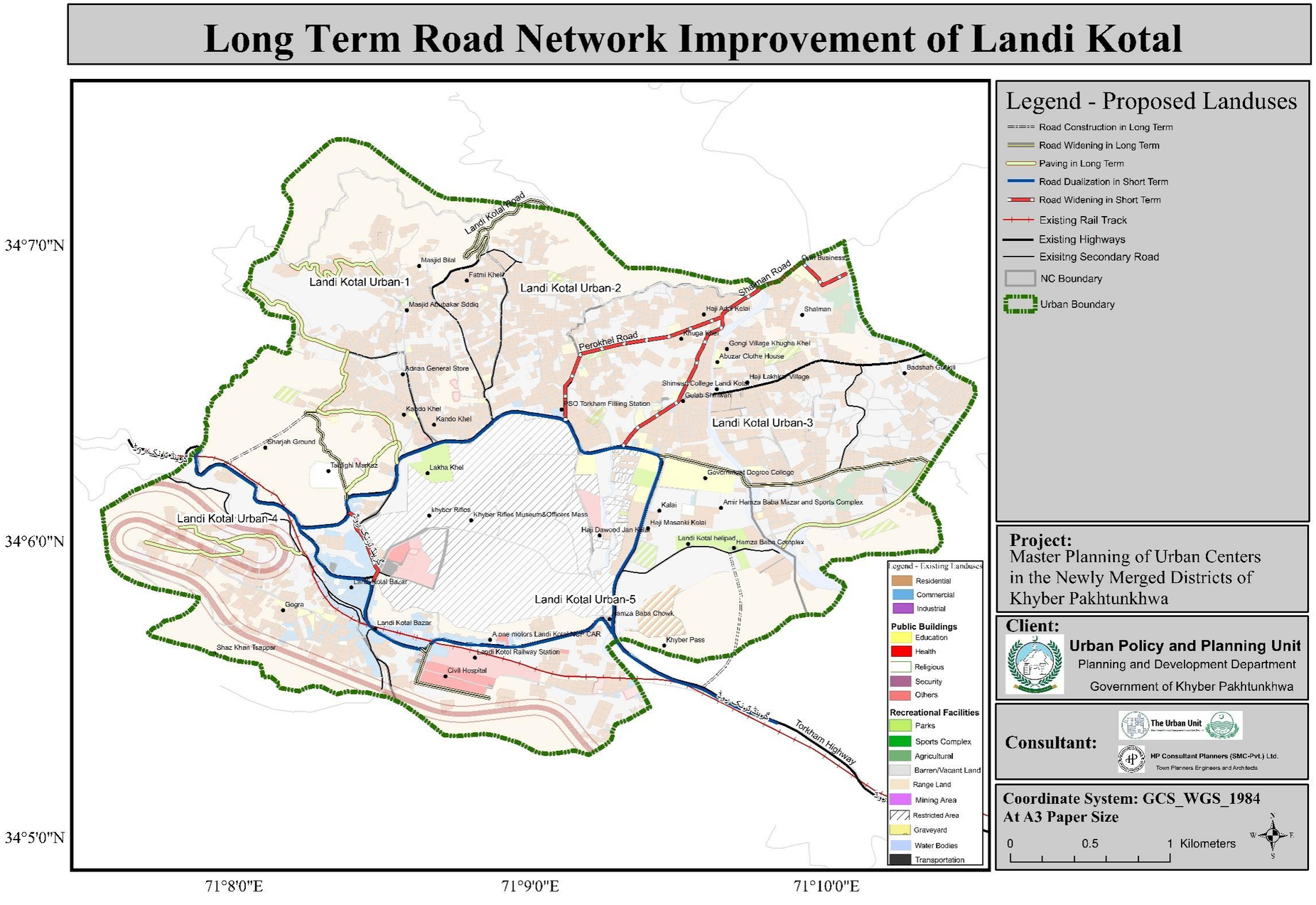


Figure 6-19: Future Peak Hour Volume to Capacity Ratios of Existing Road Network

The above analysis shows that the roads in the vicinity of the center business district/tehsil headquarter may be subject to congestion in the long term during the peak hour. This is mainly due to higher trips and their existing 1 lane cross sections which cause them to have a low capacity, approximately lower than or equal to 800 Vehicles/Hour.

It is therefore recommended that the roads highlighted in red/ yellow in the previous figure be widened to include an additional lane.



Map 25: Long Term Road Network Improvement Plan

Source: The Urban Unit

6.6.7.2 Road Network Proposal

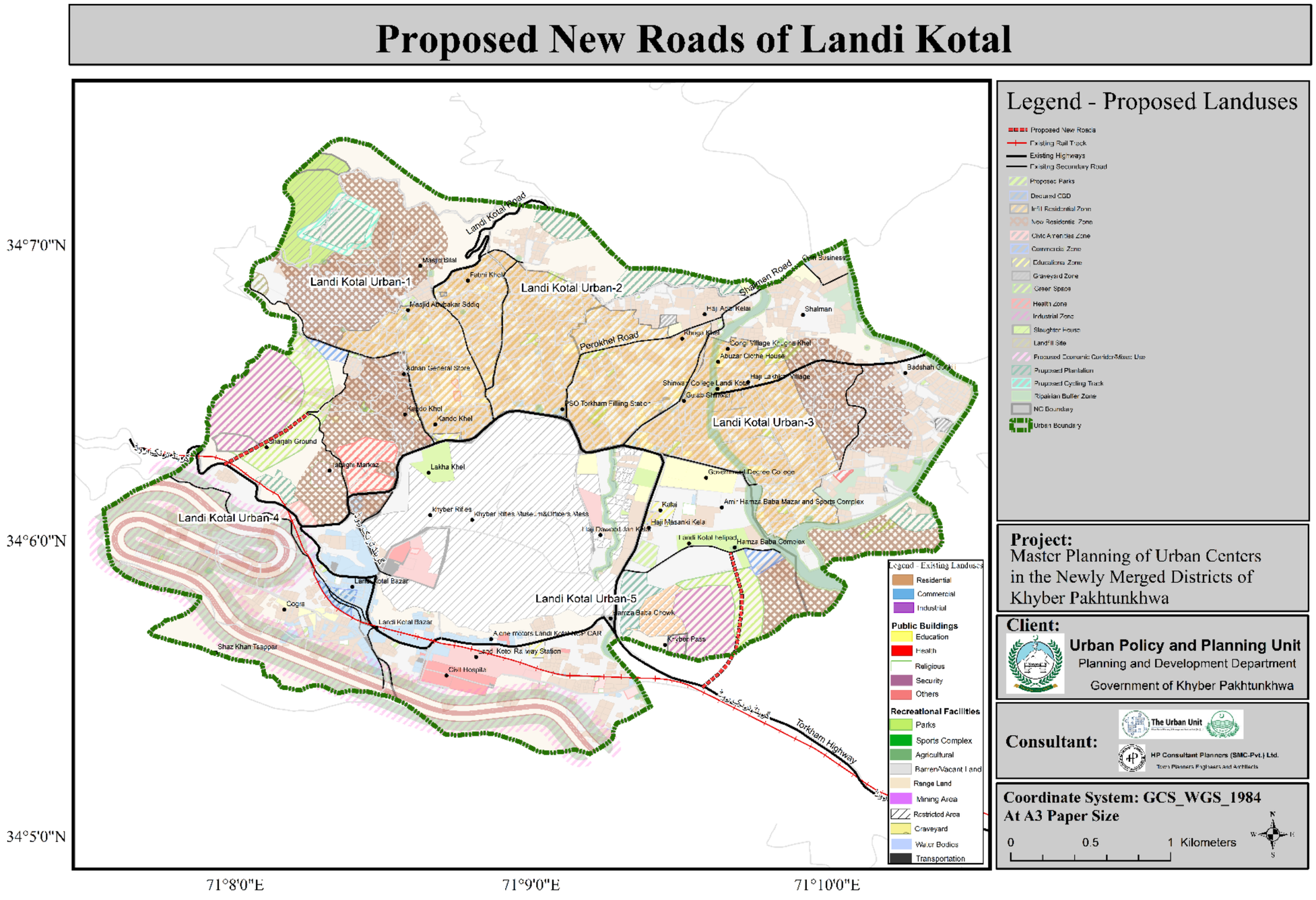
Based on the above analysis, it is necessary to widen the highlighted roads in the long term to accommodate for the additional traffic induced by the proposed land uses.

In addition, Paving and new links are required to accommodate trips produced due to new land uses situated near the Urban Boundary of Landi Kotal.

- Industrial Zone 1 (East)
- Industrial Zone 2 (West)
- Farmhouse (North)
- New Town 1 Zones (East)
- New Town 2 Zones (East)
- Grain Market (North)

Map 25 and Figure 6-20 illustrate the proposed long-term improvements and the subsequent volume-to-capacity ratios after re-assignment of traffic to new roads.

Due to the improved capacities of the new roads and the shorter travel time offered by the improved links, the model calculated several trips utilizing the new roads and an overall improved volume of capacity ratio for most links. No link exhibits a V/C ratio of more than 1 under the improved conditions.



Map 26: Proposed New Roads

Source: The Urban Unit

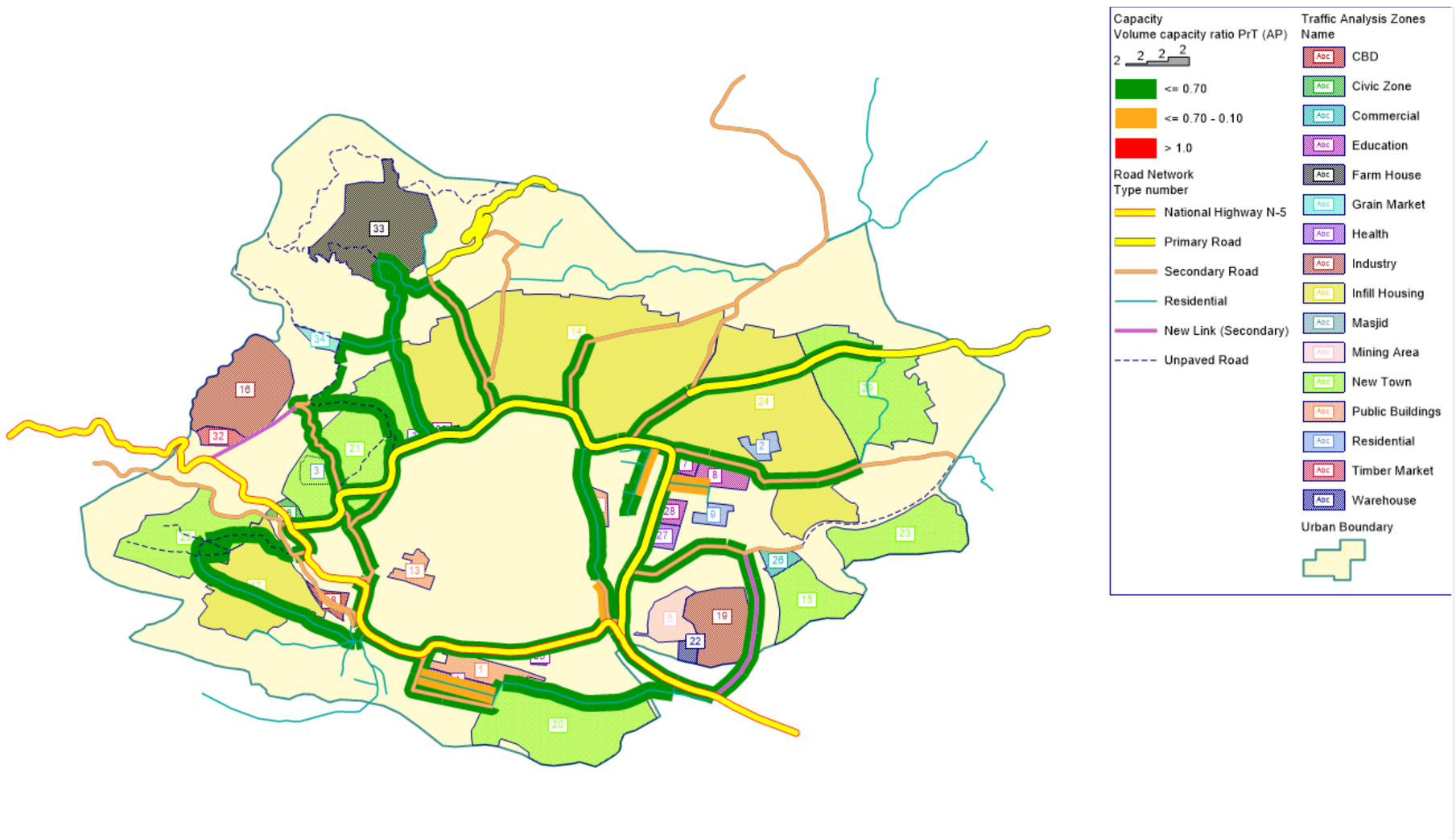


Figure 6-20: Future VC Ratios with New Roads

6.6.7.3 Proposed Cross Sections for Road Widenings and Dualizations

The widened roads are proposed to be two-lane single carriageways (3meter driveways + 2.5-meter shoulders with a total cross section of 16 meters. Sidewalks between 2.5 meters - 4.5 meters wide are to be provided on either side of the road. A typical cross-section for local roads in urban environments is shown in **Figure 6-21**.

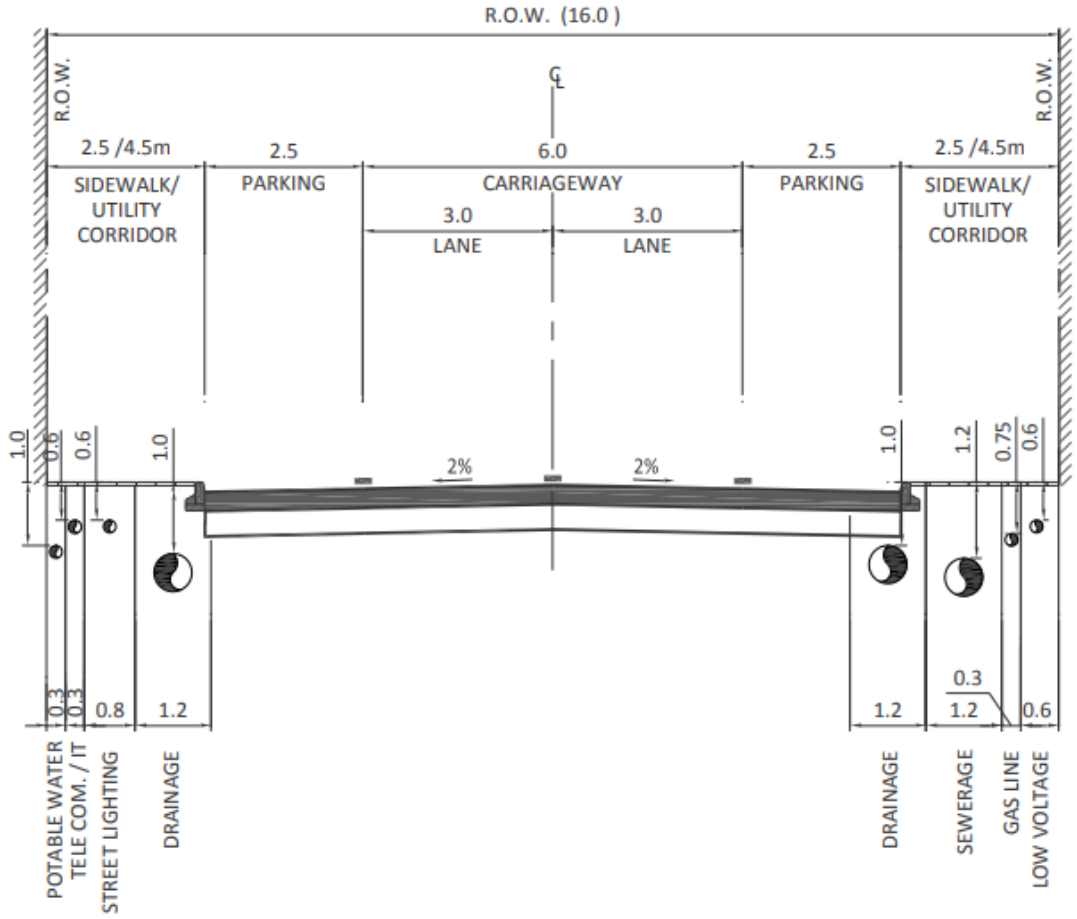


Figure 6-21: Typical Cross Section Single for Carriageway/ Roads

Source: Geometric Design Guidelines (UPPU)

The dual roads are proposed to be four-lane dual carriageways (7.3 meter driveways + 2.5 meter shoulders + 3 meter median with a total cross section of 30 meters. Sidewalks between 2.5 meters - 4.5 meters wide are to be provided on either side of the road. A typical cross-section for local roads in urban environments is shown in the **Figure 6-22**.

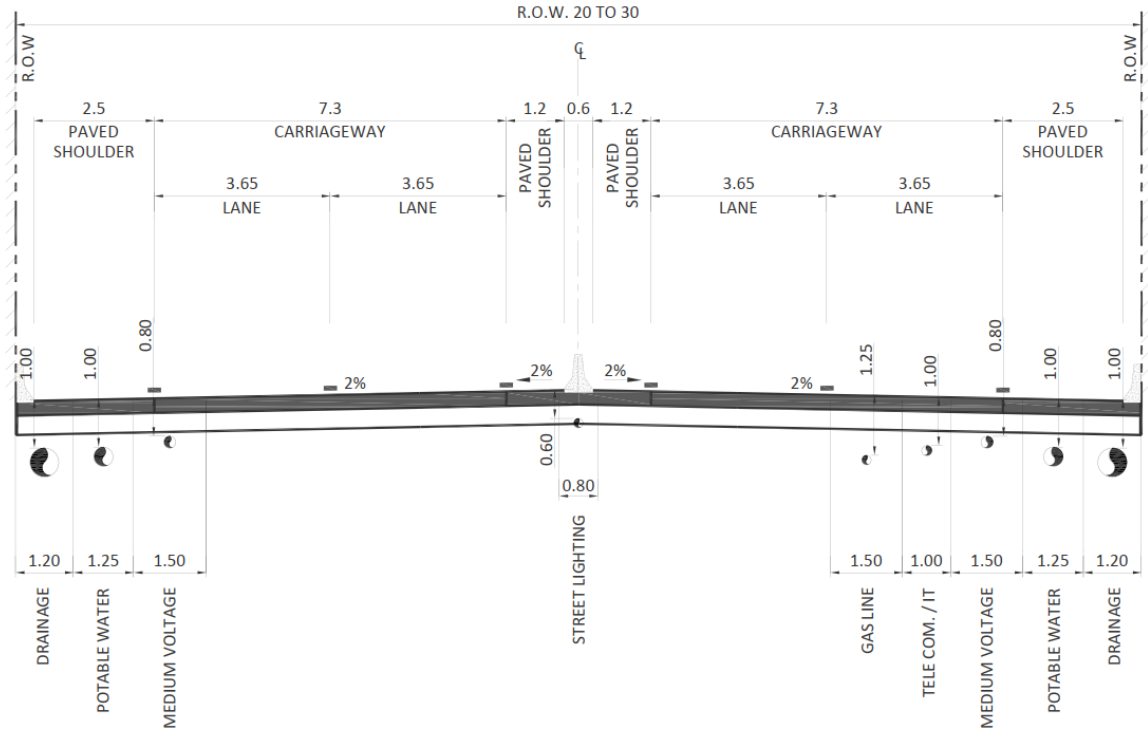


Figure 6-22: Typical Cross Section for Dual Carriageway/ Roads

Source: Geometric Design Guidelines (UPPU)

These typical cross sections are based on the Khyber Pakhtunkhwa Geometric Design Guidelines published by the Urban Planning and Policy Unit of Khyber Pakhtunkhwa and can be obtained from:

https://urbanpolicyunit.gkp.pk/wp-content/uploads/2018/07/Interim-Report-3_GDM_KP_12-01-2018.pdf.

In terms of Right-of-ways, the minimum right of way to be acquired should be at least 16 meters for widening and 30 meters for dualization based on the proposed cross-sections and the owning authorities' own standards. These, however, may be modified based on actual availability of land during implementation.

6.6.7.4 Provision of Footpaths or sidewalks

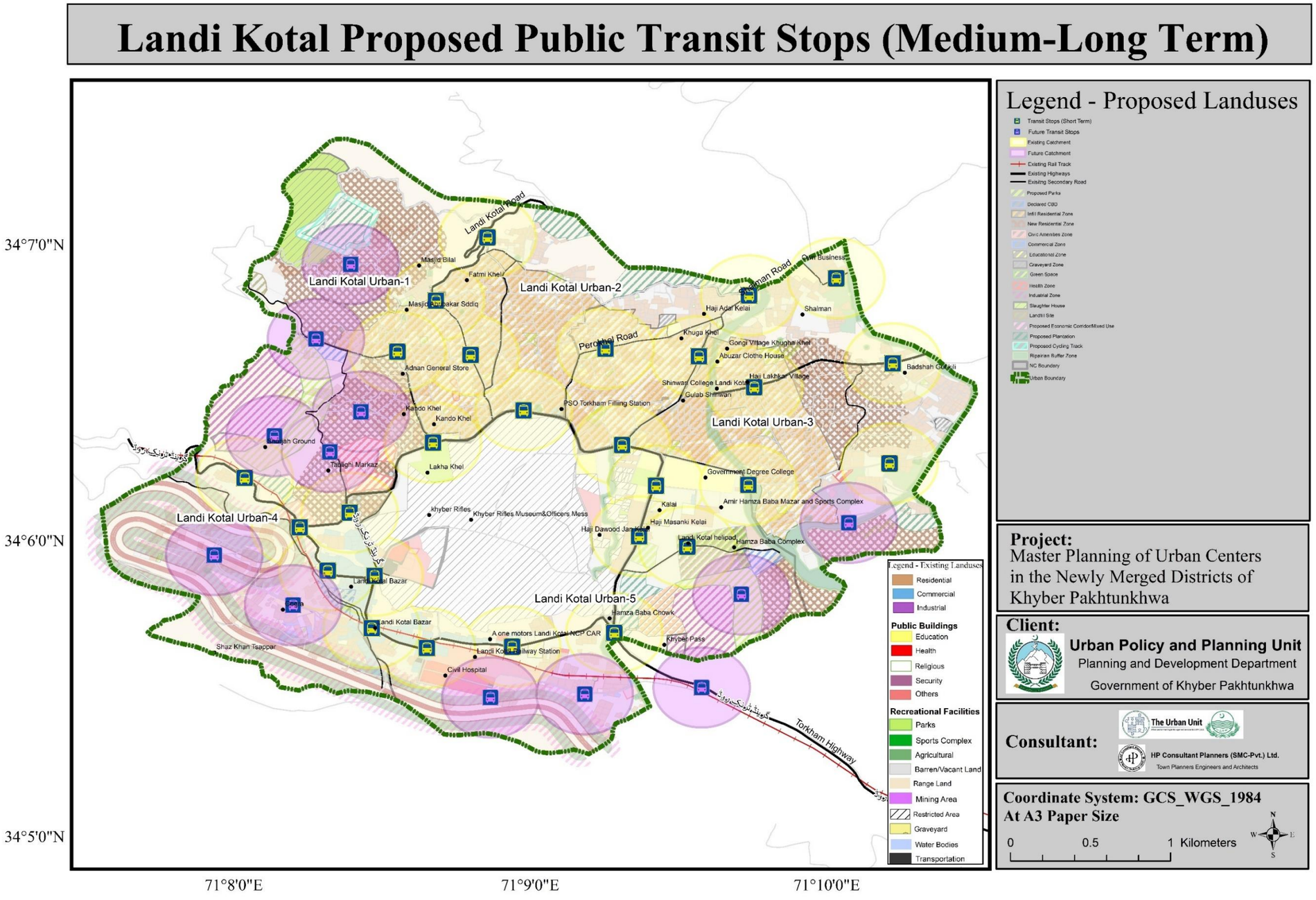
There is general absence of sidewalks on most of the urban roads in Landi Kotal, forcing pedestrians to use the confined road space. It is therefore recommended that in all future road extensions or construction projects in the urban areas of Landi Kotal include the provision of sidewalks. The construction of all sidewalks should follow the following guidelines.

- Sidewalks should blend in with the surrounding streetscape.
- Ribbon sidewalks should be provided in populated areas.
- In heavily populated areas, a sidewalk should be provided on both sides.
- Sidewalks and street tree strips should be as wide as possible and in proportion to the width of the road and street.
- Footpaths should be wide enough for two people to comfortably pass each other. Wheelchairs should be able to pass each other and turn around with enough space between them.
- At any pedestrian crossing, pedestrian ramps should be provided, and separate ramps should be associated with each intersection.
- The detectable warning strip should be painted in a bright color that contrasts with the adjacent pavement
- where appropriate, permeable pavement should be used instead of impermeable pavement with proper storm-water protection.

6.6.7.5 Enhanced Public Transit Services

Building upon the public transit service areas proposed in the short-term, a medium/long term public transit strategy is also provided to facilitate the future land use zones.

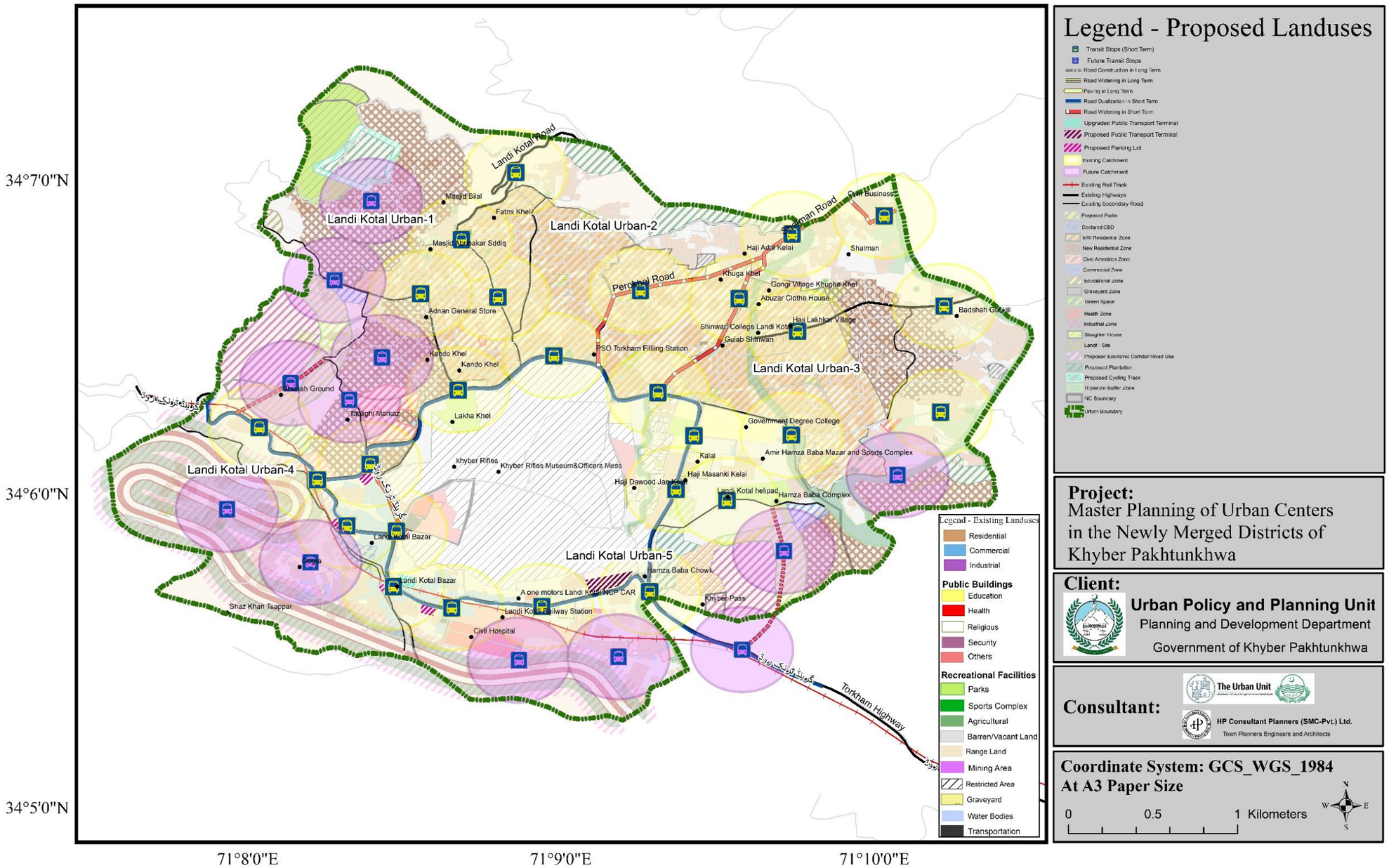
Map 26 illustrates the locations of proposed transit stops to be provided in the future. Note that these stops follow the same criteria of a 250-meter service catchment and are situated along the new proposed secondary roads. They are also situated such that future land uses can be accommodated. The route planning and scheduling between all the proposed stops can be determined by the relevant implementation agency.



Map 27: Medium/Long Term Public Transit Stops

Source: The Urban Unit

Overall Road Network of Landi Kotal



Map 28: Overall Road Network

Source: The Urban Unit

6.6.7.6 Restoration and Rehabilitation of Peshawar Landi Kotal Railway track

The existing railway services between Peshawar and Landi Kotal have been halted in the recent past. The Household information survey revealed that a significant number (58%) of the respondents spend less than Rs100 on their daily commute and require a cheaper source of travel. It is recommended that the historic railway line be restored and upgraded to support a greater moving population in the coming years.

6.6.7.7 Regulatory Measures

In addition to the infrastructure and systemic interventions proposed in this transportation plan, it recommended that the regulatory measures be adopted to not only regulate Landi Kotal's mobility, but also fulfill the technical and capability prerequisites for implementing the transportation engineering and services proposals.

Removal of Roadside Encroachments

The intrusion of businesses, vendors, street hawkers, makeshift taxi stands, and illegal on-street parking onto the right-of-way of the main road in Landi Kotal's commercial areas is a major cause of traffic congestion and pedestrian inconveniences.

Controlling encroachments that cause traffic jams and peak hour congestion is therefore required along the Landi Kotal road network. It is proposed to implement a strict policy that discourages encroachment of the road space. The policy is to be enforced by the city's administration via policing. Establishing an Anti-Encroachment Squad as has been done by the Municipal Corporation of Lahore may be considered.

Figure 6-23 illustrates the problematic areas where encroachment removal and vigilance are recommended on an urgent basis.

Figure 6-23: Encroachment Removal Areas in Landi Kotal Bazar

In addition to hard measures for encroachment removal, complimentary actions such as educating local communities about their responsibilities would also be beneficial in the long term for the urban realm.

6.6.7.8 Institutional Capacity Building

The post-2018 scenario of the Khyber Pakhtunkhwa, with administrative amendments, has brought new opportunities for growth and development. For this purpose, the development of institutions and data repositories of existing infrastructure is required. In this context, it is essential to enhance the capacity of the relevant supporting institutes like Construction and Works Department (C&W), Local Government and Rural Department, Transport Department and Traffic Police Department in terms of both manpower and equipment.

The primary institution overseeing transportation in Landi Kotal is the Transportation Line Department of the Khyber District Administration. It is recommended that the following personnel and equipment, at minimum, be provided for the planning, execution, and monitoring of the proposed transportation related interventions.

Table 6-39: Recommended HR and Equipment for Institutional Capacity Building

Human Resource	Responsibilities	Nos.
Civil/Transportation Engineer	- Preparation of PC-1s for infrastructure construction projects - Tendering and Procurement of Design and Construction Services. - Monitoring transportation development activities.	1
Technical Writers (Engineers or DAEs)	Assisting the Engineer in preparing requisite documents for project conception, procurement, and implementation	2
GIS Operator (BS or DAE)	Assisting the Engineer Preparation of Transportation Infrastructure Maps	1
Quantity Surveyor (DAE or Engineer with expertise in CAD)	Estimation of Material Quantities from preliminary designs for costing and procurement purposes	1
Public Transport Officer (BSc.)	Issuance of Route Permits to Vehicle Operators Maintaining Database Record of Route Permits	1
Facilities	**Purpose**	**Nos.**
Computers or Laptops equipped with basic software and GIS, CAD.	1 per personnel to prepare reports, drawings, cost estimations, maps, letters, and communicate with other entities.	6
Printer	One for entire transportation team	1

As Landi Kotal develops as an urban locality and the District Administration matures, it is recommended that the relevant department develops in-house surveying and design capabilities for planning and design of their transportation infrastructure in the long-term.

6.6.7.9 Provision of Road Signage

Signage systems are visual information aids that include signs, arrows, maps, pictograms, color scheme systems, and a variety of typographic components. Signage

systems with different colors, themes, materials, shapes add color in the road environment and present a colorful view to the public. Most of the black spots on the road network in Landi Kotal city can be eliminated by providing appropriate signage facilities.

Each newly constructed road and transportation facility is recommended to be supplemented by appropriate traffic and way finding signage. Examples of some road signs include:

- Distance Markers
- Way Finding Signs
- Posted Speed Limit Signs
- Populated Area Signs
- Transport Terminal Signs
- Tourist Attract Signs
- Road Hazards Signs (steep slopes, sharp turns, etc.)

Signage examples are shown in **Figure 6-24**. Detailed specifications of the recommended signage in terms of colors, dimensions, and font size can be obtained from the Punjab Geometric Design Manual Available on the Urban Unit's publications webpage: https://urbanunit.gov.pk/Download/publications/Files/8/2021/PGDM-Vol-2.pdf. The Ontario Traffic manuals may also be referenced for signage dimensions via this link: https://inps.net/graphics/sites/default/files/pdf/MTO-Book-5.pdf

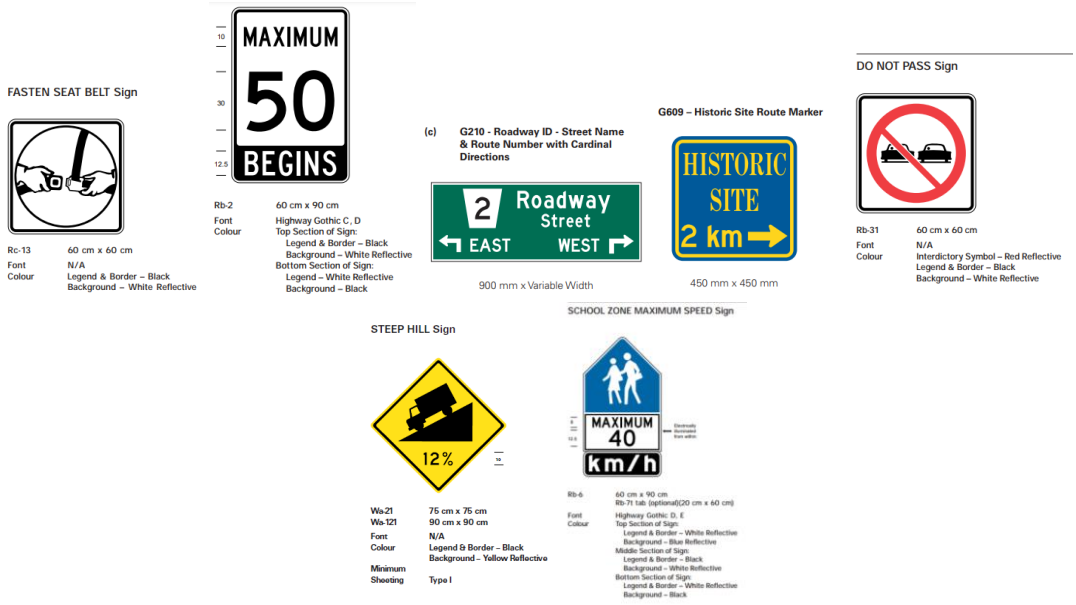


Figure 6-24: Example Roadside Signage

Signage is recommended to be written in both English and Urdu script to accommodate the local people of the region.

6.6.7.10 Summary of Medium- and Long-Term Intervention

Road Infrastructure

- Widening of two unnamed roads to 50 ft (Figure 1-21)
- Paving of unpaved road (Figure 1-21)
- Construction of New roads (Figure 1-21)
- Provision of Sidewalks along Secondary and Local Road Network.

Public Transport

- Restoration and Rehabilitation of Peshawar Landi Kotal Railway track

Regulatory and Institutional (Continuous)

- Removal of Roadside encroachments in Landi Kotal Bazaar Area
- Placement of Road Signage
- Institutional Capacity Building for Landi Kotal Transportation Projects with Noted HR and Equipment
- Develop In-house planning and design Capabilities for future planning in Landi Kotal.

6.7. Landfill Site

The potential controlled landfill sites have been identified in Landi Kotal. The dumpsite area shall withstand the waste load of 25 years for Landi Kotal is 2.5 acres (1 Hectares). It is proposed that TMA should acquire this land on a priority basis to avoid open dumps in the area. This will help control illegal dumping of waste into drains and water bodies. Maps for Landfill suitability and identified land for potential disposal sites have been depicted in figures below:

Table 6-40: Area Requirement for Land fill site

Area Required for Controlled Dumpsite		
Design Criteria	Density (ton/m^3)	1
	Depth of L.F (m)	15
District	Dimension	Value
Landi Kotal	Volume (m^3)	147,665
	Area (m^2)	9,844
	Area (Acres)	2.5
	Area (Hectares)	1

Source: Recommended by the Urban Unit and HP Consultants

6.7.1. Rationale for Proposed Landfill Site:

The following parameters have been considered to identify zones for a landfill site in Landi Kotal.

- **Airports:** If a landfill is located within a specified distance of an airport, the owner or operator must demonstrate that the Landfill will not present a bird hazard to aircraft. The minimum acceptable distance of the Landfill from the airport is 5 km.
- **Flood plains:** For landfills located on a 100-year flood plain, the owner or operator must demonstrate that the Landfill will not restrict the flow of a 100-year flood, reduce the storage capacity of the flood plain, or result in the washout of solid waste.
- **Wetlands:** New landfills and lateral expansions can only be located in wetlands with no practical alternative.
- **Fault areas:** New landfills and lateral expansions must not be located within 200 feet of a fault area.

- **Seismic zones:** New landfills and lateral expansions are restricted in areas susceptible to ground motion resulting from earthquakes.
- **Unstable areas**: Unless demonstrated otherwise, landfills must not be located in areas susceptible to natural or human-induced events or forces capable of impairing the integrity of landfill components. Examples of unstable areas are those with poor foundation conditions, areas susceptible to mass movements (landslides, rock falls, etc.), and areas with karst terrains (sinkholes).

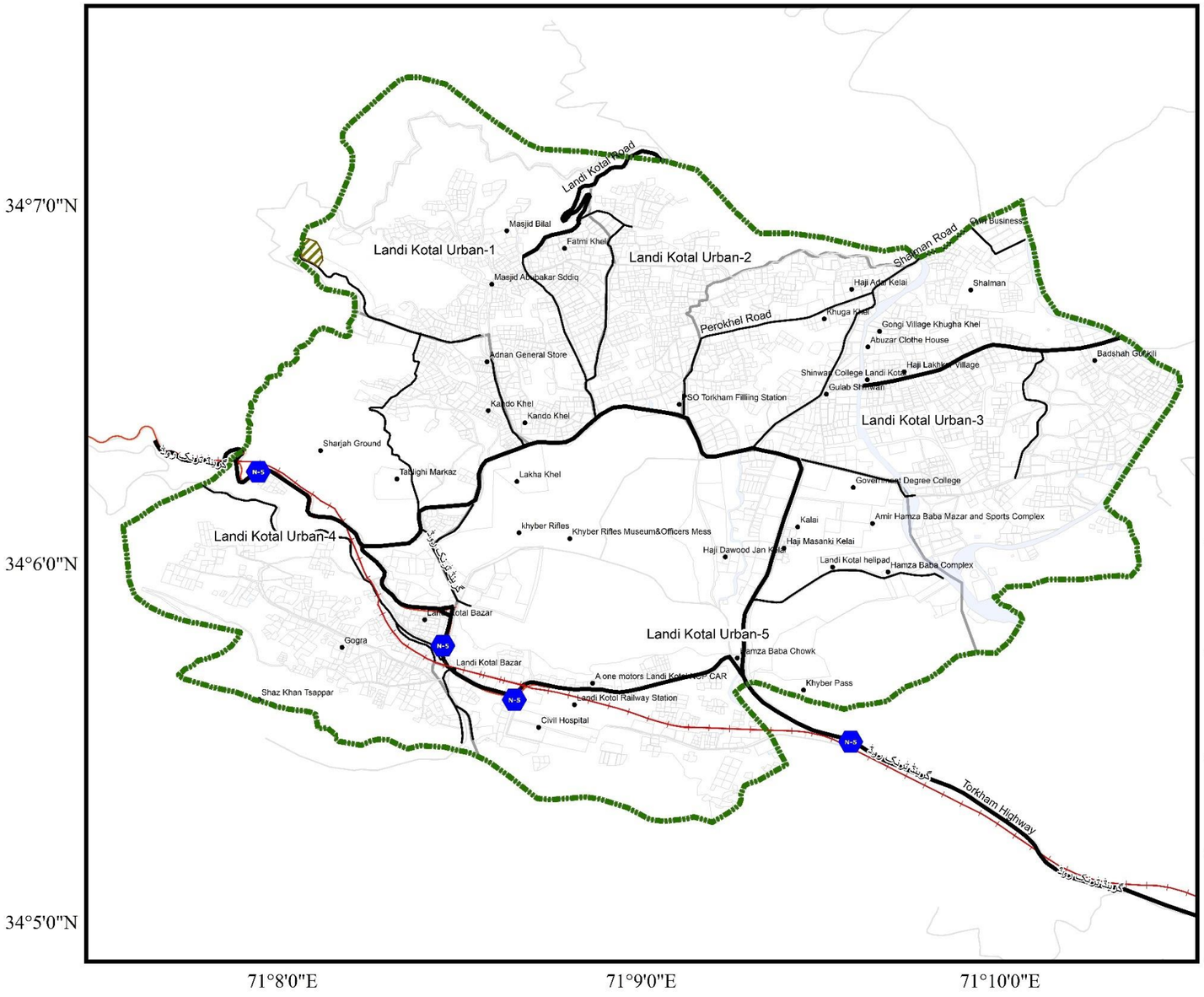
As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repeal if Building Control Authority Notify any Land Use Classification Rules applicable in KP. The development guidelines for Landfill sites are below:

Table 6-41: Landfill Site Guidelines

Permitted Uses	Allied Permissible Uses	Prohibited Uses
Sewage treatment plant/disposal work, Water treatment plant, Solid waste dumping yards, Treatment or recycling plant, Petrol pump, Gas filling station, Grid station, Taxi/rickshaw stand, Parking lot.	Heavy, large and extensive industries, Loading/unloading facilities, Workshops for buses, Slaughter-housing, wholesale mandis, Public utilities, Servicing/repair of farm equipment and machinery, Industrial Park.	Residential housing schemes; private and public both, Mixed use apartment buildings. Large health, recreational commercial and educational institutions, Agriculture and horticulture, Dairy and poultry farming Recreational facilities. any other that are not in permitted or permissible uses

Source: Urban Unit and HP Consultants

Landi Kotal Proposed Landfill Site



Legend - Proposed Landuses

- Existing Rail Track
- Existing Primary Road
- Existing Secondary Road
- Proposed Landfill Site
- Water Body
- NC Boundary
- Urban Boundary

Project:
Master Planning of Urban Centers in the Newly Merged Districts of Khyber Pakhtunkhwa

Client:
Urban Policy and Planning Unit
Planning and Development Department
Government of Khyber Pakhtunkhwa

Consultant:
The Urban Unit
HP Consultant Planners (SMC-Pvt.) Ltd.
Town Planners Engineers and Architects

Coordinate System: GCS_WGS_1984
At A3 Paper Size
0 0.5 1 Kilometers

Map 29: Proposed Landfill Site

Source: The Urban Unit

6.8. Graveyard

Considering accessibility and planning standards, 04 areas for graveyards are designated in the periphery of the city. These graveyards are near the proposed zones of development for ease of access. The graveyards can be further divided according to the requirement of practiced religions in the town.

Table 6-42: Graveyard Requirement

Existing area (sq. km.)	**0.04**
Existing area (in %)	0.38%
Recommended NRM standard	0.5% to 6%
Recommended graveyard area – min (sq. km.)	0.05
Recommended graveyard area – max (sq. km.)	0.63
Gap (Recommended (min) – Existing Land Use)	0.01
Gap (Recommended (max) – Existing Land Use)	0.59
Proposed area 2040 (sq. km.)	0.02

Source: Recommended by the Urban Unit and HP Consultants

As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repeal if Building Control Authority Notify any Land Use Classification Rules applicable in KP. The development guidelines for Graveyard sites are below:

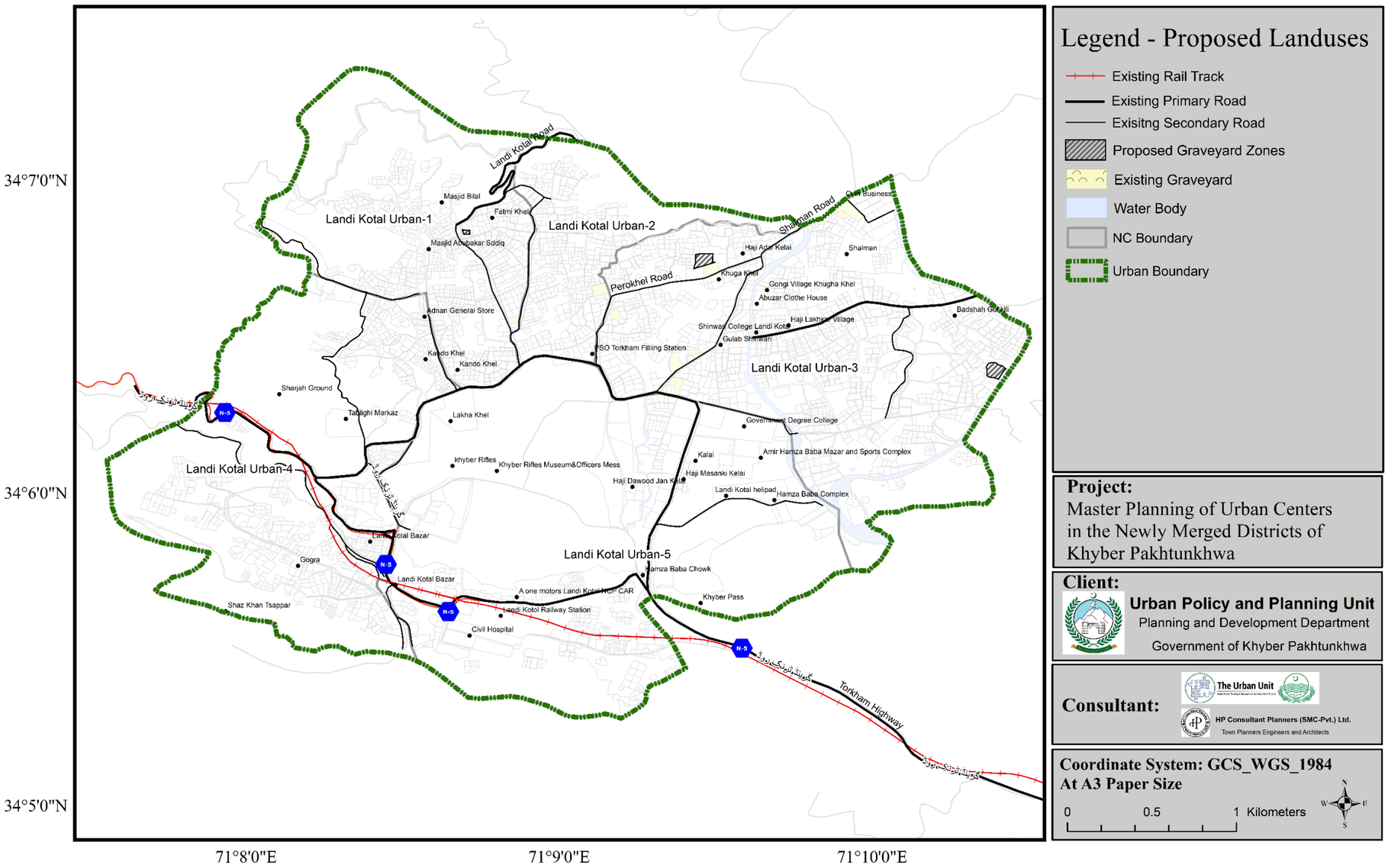
Table 6-43: Graveyard Guidelines

Permitted Uses	Allied Permissible Uses	Prohibited Uses

Administration buildings Religious building such as Mosques, Clinics/dispensaries, Local shopping areas Retail stores may also be included such as flower shop / horticulture; and convenience stores Petrol pump, Gas filling station Parking facilities	residential for graveyard workers / caretakers Shops, Zoological garden, Botanical garden, Bird sanctuary,	Heavy, large and extensive industries: noxious, obnoxious and hazardous industries, Warehousing, storage go-downs of perishables, hazardous, inflammable goods, Sewage treatment plant/disposal work, Water treatment plant, Solid waste dumping yards, Research laboratories treating contagious diseases.

Source: Urban Unit and HP Consultants

Landi Kotal Proposed Graveyard Zones



Legend - Proposed Landuses

- Existing Rail Track
- Existing Primary Road
- Exisitng Secondary Road
- Proposed Graveyard Zones
- Existing Graveyard
- Water Body
- NC Boundary
- Urban Boundary

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At A3 Paper Size
0 0.5 1 Kilometers

Map 30: Proposed Graveyard Zones

Source: The Urban Unit

6.9. Reserved Agriculture Area

The total reserved agriculture area is 0.07 sq.km in Landi Kotal. The agriculture reserved area is multifaceted, encompassing environmental conservation, food security, economic sustainability, climate change resilience, and long-term planning. This strategic allocation aims to address the growing challenges associated with urbanization, population growth, and urban sprawl. The focus of this area will be on the agro-production of locally grown commodities, and all amenities and services will be offered to increase agricultural output within city limits. In this way, the city's spatial growth will be constrained, and the core of its agricultural activity will continue to stay in the vicinity of the city. Additionally, it will result in a healthy atmosphere and control the infrastructure network's spread.

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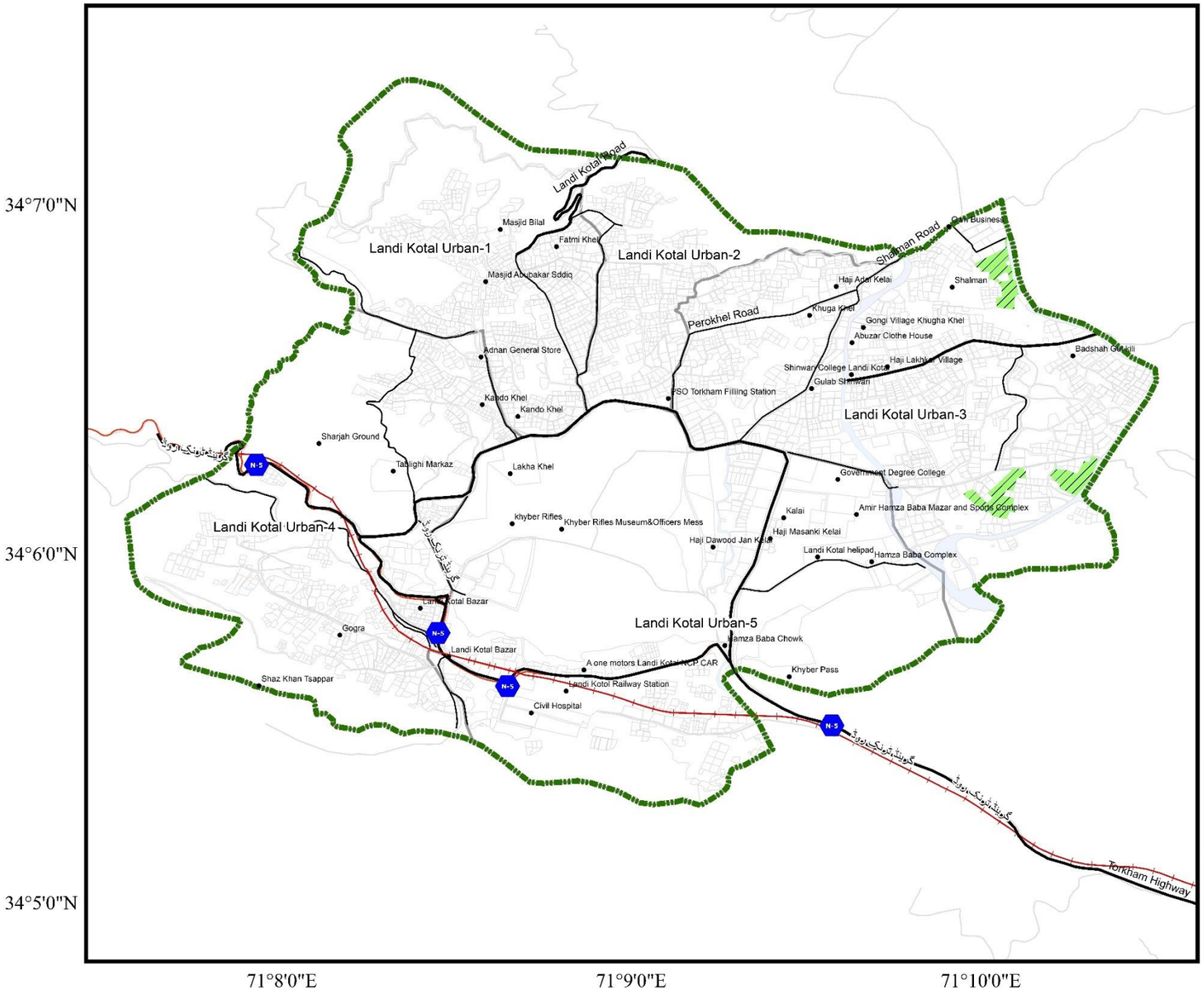
Table 6-44: Reserved Agriculture Area Guidelines

Permitted Uses	Allied Permissible Uses	Prohibited Uses
Crop, Orchard, Pasture land Forest, Nursery or a green house, horticulture, Tube well,	Country club, Zoological garden, Botanical garden, Bird sanctuary, Zoo or wildlife park, Fruit and vegetable market,	Other than permitted and permissible

Existing rural settlement or village, Agricultural machinery workshop; Farm house Storage activities of agricultural goods which are non-hazardous in nature.		

Source: Urban Unit and HP Consultants

Landi Kotal Reserved Agriculture Zones



Legend - Proposed Landuses

- Existing Rail Track
- Existing Primary Road
- Existing Secondary Road
- Reserved Agricultural Zones
- Water Body
- NC Boundary
- Urban Boundary

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Town Planners Engineers and Architects

Coordinate System: GCS_WGS_1984
At A3 Paper Size

0 0.5 1 Kilometers

N W E S

Map 31: Proposed Reserved Agricultural Zone

Source: The Urban Unit

6.10. Livestock and Dairy Development Zone

A proposed Livestock and Dairy Development Zone spanning 0.13 sq. km. aims to foster animal and milk production. It is located on the Northwest side of Landi Kotal, near to Landi Kotal Road, this zone is envisioned to predominantly comprise cattle farms accommodating a diverse range of livestock, including cattle, buffaloes, sheep, goats, camels, and poultry. The farms will also include grazing and pasture areas. The zone will host dairy farms equipped with milk processing units. This zone is intended to not only boost livestock and dairy production but also create a holistic environment that supports the well-being of the animals and ensures the efficient processing and distribution of dairy products. Slaughter house having an area of 0.0168 sq.km is proposed near the Shalman Road.

As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repealed if Building Control Authority Notify any Land Use Classification Rules applicable in KP. The development guidelines for Livestock and Dairy Development Zone are below:

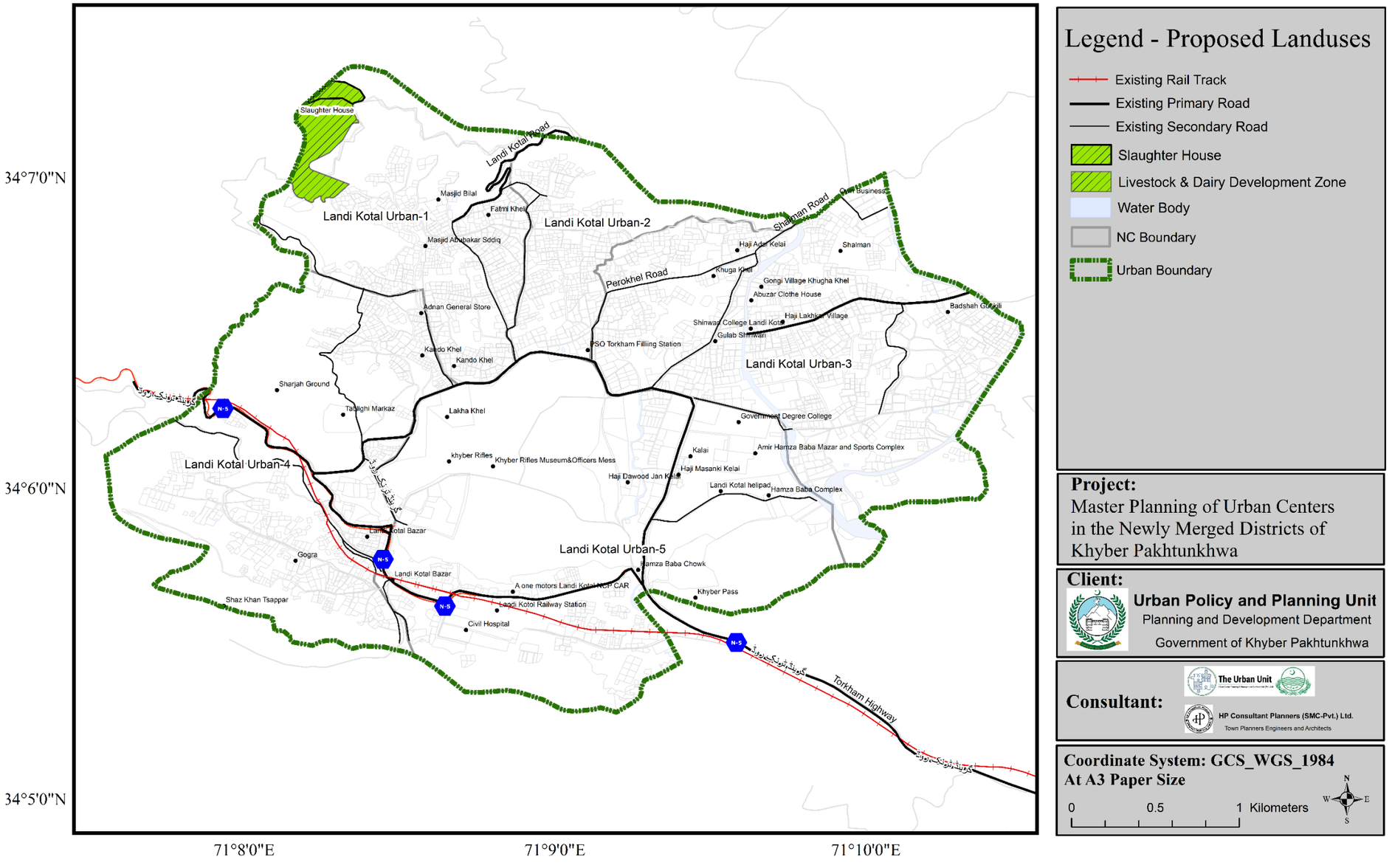
Table 6-45: Livestock and Dairy Development Zone Guidelines

Permitted Uses	Allied Permissible Uses	Prohibited Uses
Cattle Farms, Poultry Farms, Pasture and grazing lands, Slaughter Houses, Dairy production, Veterinary services,	Godowns Cold storage, Cattle Market	Other than permitted and permissible

Veterinary education and training Grain Market		

Source: Urban Unit and HP Consultant

Landi Kotal Proposed Livestock and Dairy Development Zone



Legend - Proposed Landuses

- Existing Rail Track
- Existing Primary Road
- Existing Secondary Road
- Slaughter House
- Livestock & Dairy Development Zone
- Water Body
- NC Boundary
- Urban Boundary

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Coordinate System: GCS_WGS_1984
At A3 Paper Size
0 0.5 1 Kilometers
N W E S

Map 32: Proposed Livestock and Dairy Development Zone

Source: The Urban Unit

6.11. Civic Amenities Zone

The current expanse of public buildings covers 0.11 square kilometers, and proposed civic amenities zone is spanning 0.02 square kilometers. The existing public buildings are dispersed, posing challenges for convenient, therefore in future with the rising activities more space for different public offices and amenities will be required.

Table 6-46: Civic Amenities Requirement

Civic Amenities Zone	
Existing area (in sq. km.)	0.11
Existing area (in %)	1.07%
NRM -Standards	3 %to 11%`
Recommended mixed use zone – min (sq. km)	0.31
Recommended mixed use zone – max (sq. km)	1.15
Required (Recommended (min) – Existing Land Use)	0.20
Required (Recommended (max) – Existing Land Use)	1.04
Proposed area 2040 (in sq.km.)	0.02

A new Civic Amenities Zone has been proposed along Torkham Highway Road. This strategic location ensures easy accessibility for the public. This zone involves consolidating all dispersed public buildings into this designated zone, which will house essential entities such as the Government or Semi-Government offices like District Secretariat, Town Hall and other essential buildings.

This concerted effort aims to streamline public services, enhance accessibility, and provide a consolidated hub for administrative functions. The thoughtful relocation of these key offices to the Civic Services Zone is poised to improve operational efficiency and cater to the growing needs of the district, aligning with the vision for a more organized and accessible administrative setup.

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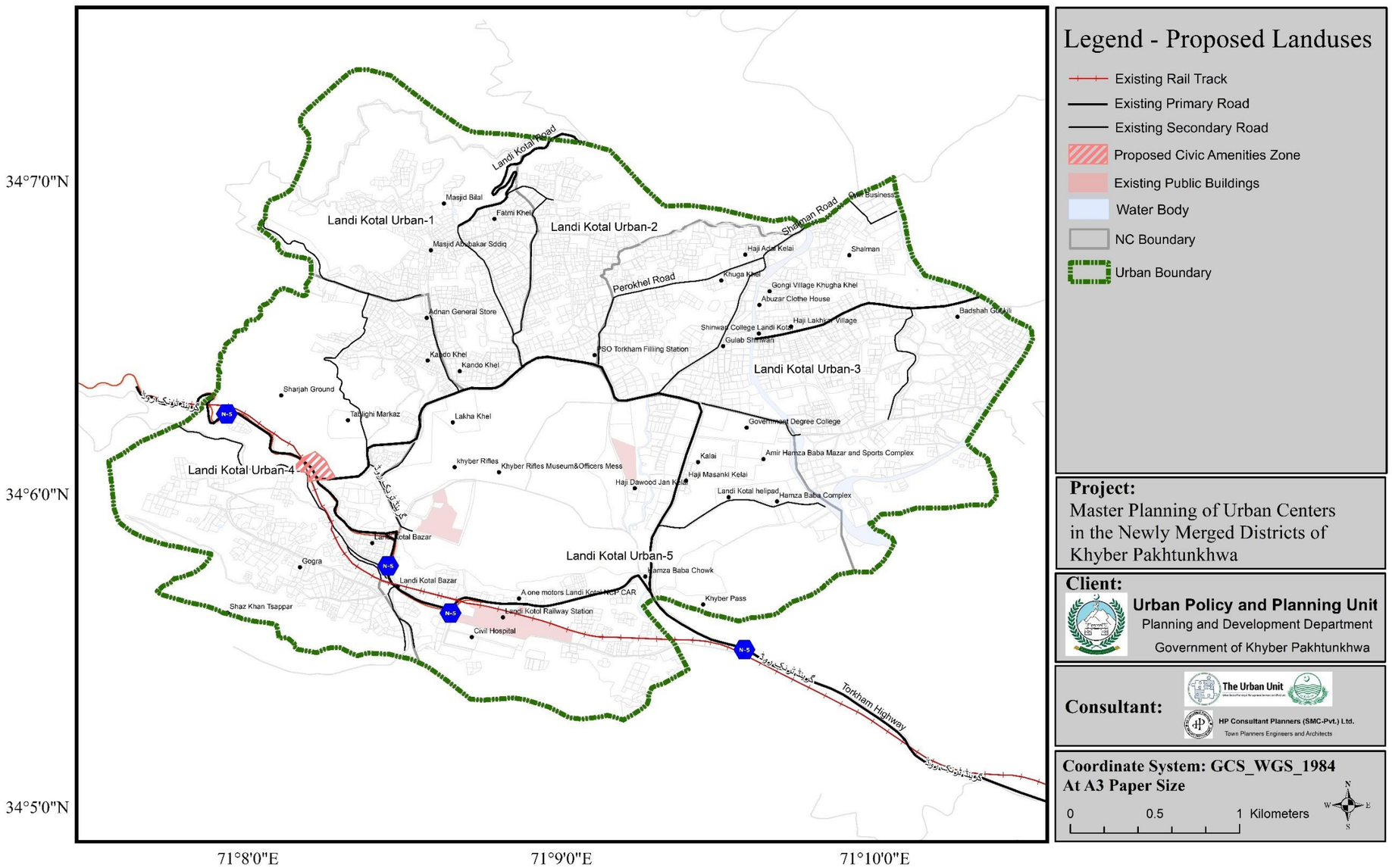
standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repealed if Building Control Authority Notify any Land Use Classification Rules applicable in KP. The development guidelines for Civic Amenities Zone are below:

Table 6-47: Civic Amenities Zone Guidelines

Permitted Uses	**Allied Permissible Uses**	**Prohibited Uses**
Government or semi-government offices (District Secretariat, Town Hall etc. Social welfare institution such as community centre, art gallery, museum and auditorium Local and zonal municipal office Police station, fire station or post office Shelter home, Pannahgahh, Convention centre	Hotel or Motel, Guest house, Athletic club, gymnasium, fitness centre or indoor sport facility, Research and development centres	Other than permitted and permissible

Source: Urban Unit and HP Consultants

Landi Kotal Proposed Civic Amenities Zone



Map 33: Proposed Civic Amenities Zone

Source: The Urban Unit

6.12. Green Spaces

Green spaces are essential to each community as it improve community's natural environment, aesthetic, and recreational opportunities. These are mostly used for leisure activities including cycling, walking, working out, and playing. Landi Kotal urban center has parks and playgrounds; however, these are not adequate to serve the growing population. As per the Land Use Survey of Landi Kotal, out of the 10.43 sq. km parks and sports complex covers only 0.09 sq.km and 0.001 sq.km respectively.

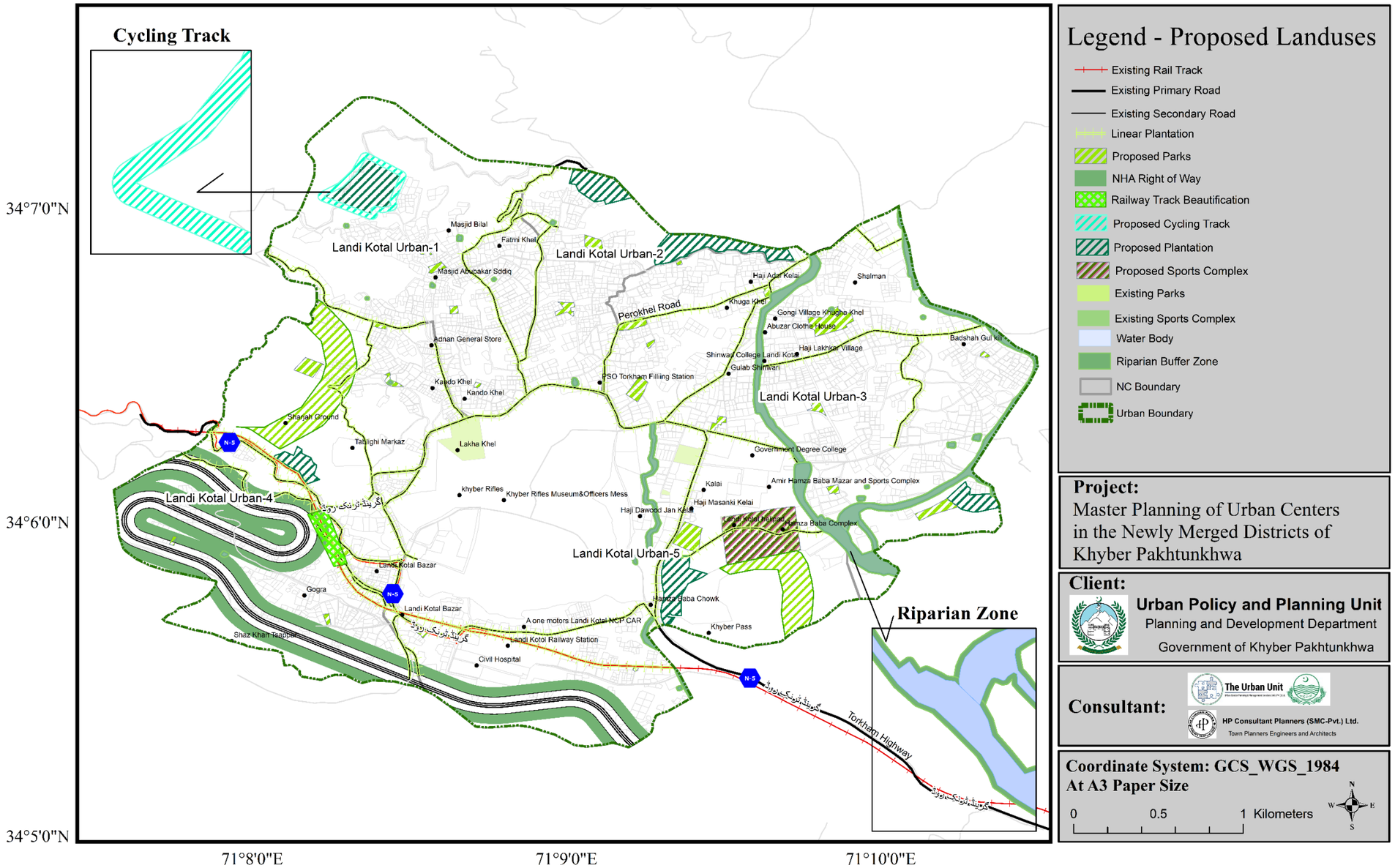
The World Health Organization (WHO) advises all cities to provide each resident with a minimum of 9 sq.m of urban green space[20]. Landi Kotal's proportion of green space falls below of the standard for cities around the globe. Therefore, dispersed green space having an area 1.17 Sq.km area is proposed to benefit the whole population.

A riparian buffer zone is a vegetated area near water bodies, it helps shade and partially protect the water body from the impact of adjacent land uses. It plays a key role in increasing water quality in associated streams, rivers, and lakes. It serves diverse purposes, for example, protection of surface waters from pollution, protection of structures from flooding or erosion, and preservation of riparian habitat. Therefore, riparian buffer is proposed along the water bodies of Landi Kotal.

Furthermore, green buffer along industrial area is proposed. Buffer zones surrounding industrial areas are established primarily to ensure that nearby residential communities are not adversely impacted by health and amenity issues that can be attributed to industrial emissions. Cycling track of 0.03 km is proposed along the proposed planation. The below map shows the proposed Green Spaces in Landi Kotal urban center.

[20] Russo, Alessio, and Giuseppe Cirella. "Modern Compact Cities: How Much Greenery Do We Need?" *International Journal of Environmental Research and Public Health*, vol. 15, no. 10, 5 Oct. 2018, p. 2180, www.ncbi.nlm.nih.gov/pmc/articles/PMC6209905/, https://doi.org/10.3390/ijerph15102180.

Landi Kotal Proposed Green Spaces



Legend - Proposed Landuses

- Existing Rail Track
- Existing Primary Road
- Existing Secondary Road
- Linear Plantation
- Proposed Parks
- NHA Right of Way
- Railway Track Beautification
- Proposed Cycling Track
- Proposed Plantation
- Proposed Sports Complex
- Existing Parks
- Existing Sports Complex
- Water Body
- Riparian Buffer Zone
- NC Boundary
- Urban Boundary

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Coordinate System: GCS_WGS_1984
At A3 Paper Size
0 0.5 1 Kilometers

Map 34: Proposed Green Spaces

Source: The Urban Unit

As per Khyber Pakhtunkhwa Urban Policy 2022–30, Land Use Building Control and Zoning Regulation needs to be defined by the Khyber Pakhtunkhwa Land Use and Building Control Authority. The authority defines the term permitted and permissible land use in the Khyber Pakhtunkhwa Land Use and Building Control Act, 2021. The permission for Permissible land uses, may be allowed by the District Planning and Design Committee subject to the payment of the fee. However, the detail planning standards or development guidelines needs to be defined. Therefore, consultant has reviewed the national and international case studies and suggest development guidelines specific to the study area. These development guidelines will be repealed if Building Control Authority Notify any Land Use Classification Rules applicable in KP. The development guidelines for Green Spaces are below:

Table 6-48: Green Spaces Guidelines

Permitted Uses	Permissible Uses	Prohibited Uses
Bird sanctuary, botanical garden, park, memorial, monument or playground, forest, orchard, picnic hut, plant nursery, place of worship, joy land or play land, farm, recreational club or resort, shooting range, swimming pool library and zoological garden.	Building and structures ancillary to use permitted in open spaces and parks such as stand for vehicles on hire, taxis and scooters, bus and railway passenger terminals, facilities such as police post, fire post, post and telegraph office, commercial use of transit nature like cinema, circus and other shows, public assembly halls, restaurants and caravan parks, sports stadium, open air cinemas, subject to the coverage, height, FAR and set backs of this zone.	Any building or structure which is not required for open air recreation, dwelling unit except for watch and ward personnel and uses not specifically permitted therein.

Source: Urban Unit and HP Consultants

Chapter 7: Way Forward

The Landi Kotal Master Plan provides a visionary roadmap for guiding the city's transformation into a resilient, inclusive, and sustainable urban center. Building on this framework, a scenario-based development strategy has been designed for Landi Kotal, rooted in land suitability analysis and evidence-based planning principles. The proposed land use zones aim to ensure compatibility with existing built-up areas while responding proactively to the future needs of the city's growing population. These zones accommodate housing, commercial, industrial, and mixed-use developments, while indirectly generating employment, improving access to services, and elevating the overall quality of life for residents.

To further consolidate the urban transformation process, a set of integrated sectoral action plans has been developed. These plans address critical development gaps across key domains—transportation, governance, economy, housing, environment, and social services—while aligning with the provincial development vision and Sustainable Development Goals (SDGs). The following sector-wise summaries outline the strategic priorities and implementation mechanisms envisioned:

- **Transportation Action Plan:** The plan focuses on improved mobility through road dualization, terminal upgrades, and rehabilitation of the Parokhel road and Shalman road. Key implementation includes the regulation of route permits, removal of encroachments, structured parking, and signage installation. Long-term success hinges on building institutional capacity within local transport authorities and phased execution based on congestion and demand analyses.
- **Rural-Urban Fringe Development:** Focusing on peri-urban zones, this plan leverages strategic zoning for agriculture, livestock, and mixed land use. The implementation includes legal enforcement through KP Land Use Act 2021, coordinated urban-rural policy alignment, and the creation of reserved green belts.
- **Economic Development:** This plan promotes investment attraction through SEZ incentives and job training schemes. Implementation includes establishment of a Development Authority, tax incentives for investors, traffic mitigation in bazaars, and pre-feasibility studies for 10 high-impact sectors.
- **Disaster Risk Reduction (DRR):** The DRR strategy incorporates early warning systems, community preparedness, and climate-resilient infrastructure.

Implementation includes GIS-based risk zoning, capacity-building drills for emergency services, and integration of DRR in land use policy.

- **Zoning and Land Management:** This action plan emphasizes digital land record management, zoning regulation enforcement, and land-use planning. Implementation involves the digitization of Landi Kotal land records, formulation of zoning by-laws, and training of revenue staff in coordination with the Board of Revenue.
- **Education:** The plan aims to bridge existing gaps through provision of new schools, especially for girls, and facility upgrades in underserved localities. Implementation strategies include GIS-based school planning, hiring trained educators, and partnerships with NGOs for community-based schooling.
- **Governance and Institutional Framework:** This plan seeks institutional strengthening via one-window cells, and inter-agency coordination. Implementation involves assigning dedicated staff in TMA offices, stakeholder training programs, and local representation in planning councils.
- **Environmental Action Plan:** This includes air quality management, urban forestry, and noise control. Implementation projects involve setting up PM2.5/PM10 monitoring stations, roadside plantation, and urban parks. Environmentally sensitive areas will be protected through regulatory zoning, while awareness campaigns will address pollution at the community level.
- **Health:** The health action plan proposes developing health facilities to meeting the population demand, recruitment of specialist staff, and ensuring equitable access to healthcare facilities.
- **Housing:** To address housing deficit, this plan proposes areas for infill development and housing allocation for all-income groups. Implementation is phased based on demand forecasting.
- **Quality of Life (QoL):** The QoL plan targets improved urban aesthetics, civic engagement, and public amenities. Key actions include establishing parks, sports complex, and enhancing walkability, supported with monitoring KPIs focused on citizen satisfaction and public space usability.
- **Security Measures:** Security enhancement will be pursued through smart surveillance, CPTED (Crime Prevention Through Environmental Design), and community policing by proposals such as installation of CCTVs, enhancing street

lighting, improving signage, and controlling entry points to sensitive areas to reduce crime opportunities and deploying trained rapid response units.

- **Tourism and Heritage:** The tourism action plan proposes the preservation and promotion of iconic sites such as Ayyub Fort, and Michni Fort and Sphola Stupa. The strategy involves site-specific restoration, and eco-tourism initiatives. Implementation will require collaboration with the archaeology department, phased investment in visitor infrastructure, and awareness campaigns to engage locals as tourism facilitators.
- **Behavior Change Communication (BCC):** The BCC action plan addresses civic behavior on waste disposal, public space usage, and engagement with municipal services. It proposes multi-level communication interventions via print, digital, and face-to-face formats. Implementation includes SOPs for outreach, partnerships with schools and community groups, and ongoing monitoring to adapt strategies based on behavioral response and feedback.
- **Slum Upgradation:** This plan promotes integrated redevelopment of informal settlements through basic infrastructure, water and sanitation, and public spaces. Implementation follows a revitalization zone strategy, aligning with SDGs. Local councils will lead resident engagement and monitor progress.

The sectoral action plans outlined above represent a comprehensive roadmap for guiding Landi Kotal's transformation into a dynamic, resilient, and well-managed urban center. Their successful implementation will depend on strong interdepartmental coordination, continuous capacity building, and community-led participation. Institutional mechanisms such as the Urban Development Authority, local TMAs, and district planning units must be empowered with technical resources, legal mandates, and financial allocations to drive the process. Importantly, progress should be anchored in results-based monitoring systems, aligned with KP’s development priorities and national SDGs. By operationalizing these strategies with commitment and coherence, Landi Kotal is poised to emerge as a model for sustainable urban regeneration in the newly merged districts of Khyber Pakhtunkhwa.